Marine Engineering
And Shipping Age

Vol. XXIX **OCTOBER, 1924** **No. 10**

Page

Editorial Comment 571
The double acting Diesel engine. Gaps to be filled in the science of naval architecture. For the special attention of certain politicians in Washington. The navy.
Marine Engineering and Shipping Age, October, 1924.

Shipping Board Consolidated Services Bringing Results 575
By Harold F. Lane
Time of ships' voyages and vessel expenses reduced. Operations more flexible. Overlapping of competing lines eliminated.
Marine Engineering and Shipping Age, October, 1924.

Motorship Engineer's Problems, The..... 577
By A. B. Newell.
Comparative merits of the engineer's work on a steamship and a motorship. More training needed for licensed berths on motorships.
Marine Engineering and Shipping Age, October, 1924.

Tug Van Dyke 3, The Diesel Electric..... 579
Atlantic Refining Company adopts Diesel electric drive in new tugs. Two tankers to be converted. 11 illustrations.
Marine Engineering and Shipping Age, October, 1924.

Marine Engineers, Men Best Fitted for Becoming 582
By David Gaehr.
Discussion of the personal qualifications of men best fitted for becoming engineers on board ship.
Marine Engineering and Shipping Age, October, 1924.

Motor Tankers Building in Europe, Large..... 583
By Our Special London Correspondent.
Deadweight tonnage of motor tankers under construction in Europe totals nearly 300,000. Description of the *British Aviator*. 1 illustration.
Marine Engineering and Shipping Age, October, 1924.

Passenger Steamship Empress of France..... 584
Marine Engineering and Shipping Age, October, 1924.

Diesel Engine, Worthington Double Acting..... 585
Further details of new double acting two cycle Worthington Diesel engine. 9 illustrations.
Marine Engineering and Shipping Age, October, 1924.

Furnace, Westinghouse Industrial Electric..... 587
Marine Engineering and Shipping Age, October, 1924.

Fathometer, The 588
Details of instrument developed by Submarine Signal Company for "sonic" sounding. 3 illustrations.
Marine Engineering and Shipping Age, October, 1924.

Boiler, Prudhon-Capus 589
Details of construction and operation of new marine boiler developed in France in which accelerated circulation is a feature. 1 illustration.
Marine Engineering and Shipping Age, October, 1924.

Contrapropeller, The Action of the..... 591
By Olav Overgaard.
Principle upon which the contrapropeller acts. Wagner and Hass types. Performance on S. S. Norfolk. 5 illustrations.
Marine Engineering and Shipping Age, October, 1924.

Fuel Oil, The Flash Point of..... 595
Résumé of U. S. Navy's investigations. Heating and pumping tests. Temperatures at which inflammable gases form.
Marine Engineering and Shipping Age, October, 1924.

Page

Oil Engine, Progressive Combustion..... 598
Details of experimental heavy oil engine designed to operate on progressive combustion principle. 5 illustrations.
Marine Engineering and Shipping Age, October, 1924.

Barges Built with Sea Sled Type Hulls..... 600
Special type of hull designed to minimize wave formation in narrow channels and to reduce resistance. 1 illustration.
Marine Engineering and Shipping Age, October, 1924.

Passenger Steamship De Grasse..... 601
Marine Engineering and Shipping Age, October, 1924.

Towing Power of Tugs, Measuring the..... 602
By Dr. G. Kempf.
Pull determined by raising towing hawser definite amount at some point and weighing resulting vertical forces. 2 illustrations.
Marine Engineering and Shipping Age, October, 1924.

Feed Water Heater, Walsh..... 604
Marine Engineering and Shipping Age, October, 1924.

Diesel Engines, Double Acting..... 605
By Major Johnstone-Taylor
Details of double acting engines developed in Great Britain by North Eastern Marine Engine Company and North British Diesel Engine Company. 3 illustrations.
Marine Engineering and Shipping Age, October, 1924.

Diesel Engineering, Practical—IV..... 607
By Louis R. Ford.
Normal Diesel engine operation. Engine room arrangements. Preparations for starting engines. 4 illustrations.
Marine Engineering and Shipping Age, October, 1924.

Water Rates of Marine Auxiliaries—IV..... 611
By E. A. Stevens, Jr., and H. E. Brelsford.
Steam consumption of auxiliaries of the second group. Steam for galley, pantry and heating. Make-up feed water. Total steam consumption. 7 illustrations.
Marine Engineering and Shipping Age, October, 1924.

Welded, Cracked Engine Frame Electrically..... 616
Cracked high pressure column repaired at Philippine plant by electric welding. 3 illustrations.
Marine Engineering and Shipping Age, October, 1924.

Naval Architects' Annual Meeting, Program of.... 616
Marine Engineering and Shipping Age, October, 1924.

Welding Applied to Shipbuilding, Electric Arc.... 617
By A. G. Bissell.
Savings that can be made by using electric arc welding instead of riveting in various construction and repair jobs. 11 illustrations.
Marine Engineering and Shipping Age, October, 1924.

Valve, Oxweld Gas Tight..... 620
Marine Engineering and Shipping Age, October, 1924.

Questions and Answers..... 621

New Books..... 624

Personal 624

Shipping and Shipbuilding News..... 626

Simmons-Boardman Publishing Company
30 Church Street, New York, N. Y.

EDWARD A. SIMMONS, President — HENRY LEE, Vice-President and Treasurer — C. R. MILLS, Vice-President
L. B. SHERMAN, Vice-President — SAMUEL O. DUNN, Vice-President — ROY V. WRIGHT, Secretary
F. H. THOMPSON, Vice-President — GEORGE SLATE, Business Manager

CHICAGO: 608 South Dearborn St. — BOSTON: 294 Washington St. — LONDON, England: 34 Victoria St. Westminster, S. W. 1.
CLEVELAND: 6007 Euclid Avenue — WASHINGTON: 17th and H Sts., N. W. — Cable address: Urasigmec, London.
NEW ORLEANS: 927 Canal St. — SAN FRANCISCO: 74 New Montgomery St.

Subscription price, United States, Mexico and Canada, $3; foreign, $4. Foreign subscriptions may be sent through our London Office, 34 Victoria Street, S. W. 1.

Generated on 2024-09-12 12:03 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Marine Engineering
and Shipping Age

Volume XXIX **October, 1924** **Number 10**

Published Monthly by
SIMMONS-BOARDMAN PUBLISHING COMPANY
30 Church Street, New York
JAMES SWAN, H. H. BROWN } Editors
L. S. BLODGETT, Associate Editor W. Z. GARDNER, News Editor

Contributing Editors
Rear Admiral C. W. Dyson, U. S. N. William T. Donnelly
Commander S. M. Robinson, U. S. N. H. McL. Harding
William Gatewood James L. Bates
Captain C. A. McAllister, U.S.C.G. (Retired)

Subscription price, United States, Mexico and Canada, $3; foreign, $4. Single copy 35 cents. Foreign subscriptions may be sent through our London office, 34 Victoria Street, S. W. 1.

MARINE ENGINEERING AND SHIPPING AGE is a member of the Associated Business Papers, Inc. (A. B. P.), and the Audit Bureau of Circulation (A. B. C.)

Request for change of address should reach us two weeks before the date of the issue with which it is to go into effect. It is difficult, and often impossible, to supply back numbers to replace those undelivered through failure to send advance notice. In sending us change of address, please be sure to send us your old address as well as the new one.

The Double Acting Diesel Engine

OF the commercial vessels at present under construction, nearly one-third are motorships. In view of the restricted condition of the world trade, the decision of such a large number of shipowners to adopt internal combustion machinery is abundant evidence of the very convincing qualities of economic operation of the motorship, and it seems certain that once their first cost can be brought within reasonable distance of the steamer this class of vessel will eventually be in the majority in many lines of trade.

The main argument against the general adoption of motorships is their high first cost. There is no doubt whatever as to their superior economy and experience shows that the cost of upkeep is certainly no more than for the steamer and in many cases it has been reported to be materially less. The principal problem, then, that confronts the designer of Diesel engines is the production of more power for each unit of weight and cost which enters into his machine.

It would appear that the limit of power per cylinder for the single acting type, now in general use, has about been reached. While it is true that the maximum capacity of a two cycle cylinder is greater than that of a four cycle of the same dimensions, the difference between the two is not as great as the purely theoretical conditions of the two types indicate, and in either case, the limit of power, as fixed by the materials at present available and the general type of cylinder construction so far adopted, is quickly reached as diameters are increased. The heat-producing capacity of the cylinder is proportional to its volume while its ability to transfer this heat to the water circulating about its walls and in its piston is measured by their surfaces. The cube quickly overtakes the square in such a race and a point is reached where, in order to have sufficient strength, the walls of the cylinder must be of such a thickness that the rate of heat transference demanded for satisfactory operation cannot be met, and a breakdown of the material follows.

While it is quite possible that metallurgical studies may eventually produce a material better able to withstand the action of intense heat than the present cast iron liners and that changes in cylinder construction will facilitate the heat transfer and thus increase the power per cylinder, one is not justified in expecting any material increase in power from these sources alone. The limiting conditions which we have mentioned have fixed the maximum cylinder diameter of a Diesel engine in the neighborhood of 30 inches. On this diameter, the two-stroke cycle can develop about 500 and the four-stroke cycle about 300 horsepower per cylinder and, so long as the single acting type of engine is adhered to, it is obvious that a large increase in power can be obtained only by a multiplication of cylinders, a solution quite impracticable in the majority of cases on shipboard and increasing, instead of diminishing, the cost per horsepower of the machinery. Furthermore, if really large powers are desired, two, three or even four shafts are necessary with an accompanying increased complication and expense.

The obvious solution of the problem lies in the development of the double acting type of engine and to this nearly all Diesel engine designers and builders appear at present to be turning their attention and remarkable progress has already been made. Experimental double acting engines are now running which develop 1,000 horsepower per cylinder, and several ships are under construction which, because of the adoption of this type of machinery, will develop from 10,000 to 12,000 horsepower in service.

The use of double acting engines will, however, by no means be confined to large powers. The fact that, with an appropriation of much less weight and space, these engines can develop in a single screw cargo steamer the same power as is being furnished by the present single acting engines, will make them equally desirable for this class of service, once their reliability is proved and this, we believe, is a matter of but a short time.

Aside from the advantages to be gained, as regards weight

Generated on 2024-09-12 12:02 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

and space, by the adoption of the double acting principle, it has a further and marked superiority in its much greater uniformity of torque and the consequent lessening of vibrational stresses on the shafting, housings and foundations. It would appear reasonable to expect a reduction in sections and scantlings, not only of the engine itself, but of the foundations and other adjacent parts of the hull as well.

Some doubts have been expressed as to the possibility of successfully working out certain details more or less inherent to the double acting type—notably the piston rod stuffing box—and one double acting engine has been constructed, and is at present running at sea, in which not only the stuffing box but the piston rod itself has been dispensed with. One has but to turn to the double acting gas engine which, for many years, has been running with entire success to realize that, as regards this particular detail, our apprehensions have but little to support them. While the cycles upon which they operate are different, the difficulties to be overcome in the development of the double acting gas and Diesel engines are quite similar and the recognized efficiency of the former would seem to insure, beyond any margin of doubt, the eventually successful development of the latter type of engine.

The Diesel is still in the process of development and it is not yet possible to forecast with any certainty just what the eventual and practically universal type will be. That such an engine will sometime be evolved, there can be little doubt. The process of developing and perfecting the internal combustion engine is quite similar to that which resulted in the multiple expansion engine, for many years the standard and practically universal type of steam engine, as applied to marine propulsion, and there is every reason to believe that a similar result will finally be arrived at with the Diesel.

On paper, the two cycle, double acting engine appears to possess most of the qualities which it is desirable for a marine engine to have. It is compact, of relatively light weight and gives a more uniform turning moment than any other type. In practice, however, the problem is not so simple. The rate of combustion which can be carried on for indefinite periods in a two cycle engine appears to be in some doubt, as the power rating of most two cycle engines seems rather optimistic and, so far as we have been able to judge from the rather meager records which have come to us, the power continually developed in service is often materially less than the rated power and the gap in power production per unit of weight which lies between the two and four cycle engines is not as great as, at first, it appears to be.

On the other hand there are certain difficulties to be overcome in applying the double acting principle to the four cycle engine and it seems not unreasonable to expect that the larger clearances made necessary in order to accommodate the valves on the lower end of the cylinder will have the effect of reducing the superiority in thermodynamic efficiency usually shown by the single acting engines of this type.

In any case, it is safe to say that successful double acting engines of both types will very shortly be in service and, although there are still difficulties to overcome, we are quite satisfied that the double acting engine has come to stay and that its use will rapidly expand. As to what the eventual engine may be, whether two or four cycle, only long experience in varied service can determine. We are inclined to believe that in cases where great power is the foremost requirement the two stroke cycle is likely to prevail, but for other services the problem is too involved and complicated to justify any prediction. Only time can tell.

Gaps to Be Filled in the Science of Naval Architecture

THE application of scientific methods to the solution of the problems of naval architecture as well as systematic investigation and research in the many and varied divisions of this science are of comparatively recent origin. Shipbuilding has very largely developed by the trial and error process and the first attempts to apply scientific methods and mathematical analysis to the solution of its many problems date back less than 100 years. The scientific naval architect, as we now know him, is a product of the last 60 years.

The principles underlying the performance of a vessel are not, because of their complex nature, amenable to exact mathematical treatment to the extent that prevails in many other branches of engineering science, as, for instance, electrical engineering. The laws of physics undoubtedly rule the action of the various forces which affect the condition and performance of a ship afloat and in motion just as they do the stresses in a loaded bridge, but while the latter presents a definite and relatively simple problem, the former is surrounded by a complexity of varying and so far as our present knowledge has progressed, often indeterminate conditions, not susceptible of exact mathematical analysis. The general principles underlying the different actions which take place are understood, but between the results of scientific calculation, and the actual performance, a gap of greater or less extent exists in nearly every instance.

In the case of problems relating to displacement and subdivision, mathematical accuracy is most nearly possible, and the results of calculation and actual performance agree for all practical purposes. But, even here, there is often a gap to be bridged. While, for a certain assumed condition of loading, it is possible to calculate what subdivision is necessary to ensure a specified reserve of buoyancy when damaged, the result depends, in large extent, upon an assumed permeability of cargo, when flooded, and, in actual service, this may or may not be correct for a particular time when damage and flooding occur. While this possibility of error cannot be laid to defective or incomplete theory, it is, nevertheless inherent to this class of problem and serves to illustrate the difficulty, if not the impossibility, of obtaining an exact solution, by calculation alone, of many of the problems which arise in the design of a ship. Fortunately the need of an accurate determination of subdivision is most pressing in the case of large and fast passenger ships and in these the relatively small amount of cargo, as well as its rather uniform character, reduce the chance of error and the calculated "damaged" draft should be practically correct.

At first glance stability would also appear as something which may be calculated with exactness. So far as the buoyancy end of the righting lever is concerned, it is entirely possible to calculate the locus of center of buoyancy and the corresponding metacenter for all possible positions of the

Generated on 2024-09-12 12:11 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

ship, although at the expense of an enormous amount of detailed and laborious calculation. The weight end of the lever, however, presents greater difficulties. The calculation of the position of the center of gravity for any given condition is simple enough in principle, the accuracy obtained depending largely upon the experience and what might be termed the "personal equation" of the calculator and his ability to correctly take account of every detail and modifying condition—altogether an involved and intricate task. Here again, change of condition and distribution of weight, over a period of time, come in to confuse and complicate the problem, and the effect of varying cargo stowage, fuel consumption, free water or oil surfaces; all have to be taken into account, if the different conditions of stability arising during a voyage are to be adequately covered by the calculation.

Admitting that the stability actually possessed by a vessel may be calculated with sufficient accuracy for all practical purposes, there remains to determine the amount of stability which a proposed ship should have in order to insure her safety and seaworthiness under all probable conditions of service—and this is another matter. Dangerous rolling will occur in a well designed and properly loaded vessel only when synchronism of the wave and rolling periods is approached. The less initial stability the ship has, the less likely is such a condition liable to occur. A ship may have a longer rolling period than the period of any waves she is likely to encounter and still have sufficient stability for safety, but it must be remembered that the effective wave period, so far as the vessel is concerned, depends upon her course as related to that of the waves so that it is quite possible for a ship with a rolling period longer than that of the actual waves encountered to roll heavily and possibly to a dangerous extent under certain conditions. It seems obvious that the ability to absorb dynamic effects, as measured by the area under the statical stability curve, should be sufficient to take care of all possible combinations of forces which may arise, but just what range is necessary for different classes of ships and conditions of service is a difficult and involved problem to solve. The somewhat doubtful results obtained with certain of the latest and finest passenger ships, and the fact that occasionally an apparently well designed cargo vessel "turns turtle" for no apparent reason would appear to indicate that a considerable gap still exists between the theoretical knowledge of stability and its successful application in practice.

In matters of strength, and the question of distribution of stress through a ship's structure, comparatively little scientific investigation having actual practical value has been accomplished since the general method of calculation based upon the longitudinal weight and buoyancy distribution curves was first developed. It has to be admitted that the buoyancy forces acting upon a ship at sea are not susceptible of accurate determination, but it would seem that much may still be done in the way of investigating the distribution of stress through a vessel's structure. The fact that ships are in service and giving no indication of undue straining action, notwithstanding that the ordinary strength calculation, as applied to them, shows excessive stress, indicates that the results obtained by computation are mainly of value for purposes of comparison. Some work has already been done in measuring actual strains in ships' hulls—notably with the destroyer *Wolf* in England under the direction of Sir John Biles. It is to be hoped that further investigations along this line may make possible a more intelligent arrangement of structure and distribution of material than is now thought practicable when considered from the view point of past experience alone.

The determination, mathematically, of transverse stress is in even less satisfactory condition. There is a broad field open to the investigator of racking and twisting stresses, and for the differentiation of purely local effects and general structural conditions. All questions of stress and strain are very largely influenced by the ability to resist flexure of the various members, particularly when under compression. In this connection, the investigations of Dr. Bruhn on plating and stiffeners under stress is notable, and we trust that the work so ably commenced may be further proceeded with. It is only by such experiments and investigations as these that actual and definite knowledge of this complicated but most important subject may be obtained.

In no branch of naval architecture and marine engineering has more extended and valuable scientific investigation been carried out than in that which is concerned with the speed of ships. Starting with the monumental work of the elder Froude and continued to the present day investigations of such men as Admiral Taylor and Dr. Schaffran, the best and ablest minds of the profession have been steadily turned to the study of the resistance and propulsion of ships.

In no branch of the science of shipbuilding is scientific method more firmly established or generally followed than in the powering of ships, but, notwithstanding the very great progress which has been made in the analysis of the allied subjects of resistance and propulsion and the material and definite knowledge generally available as the result of this progress, there still exist gaps between the most carefully calculated resistances and powers and the results actually obtained.

Even with the results of tank experiments at hand, the average naval architect does not feel justified in selecting too close or optimistic a propulsive coefficient and may be said to be in the position of counting the cents in his resistance computations, without knowing how many dollars may be needed for the final result in terms of power delivered to the propeller. This situation is mainly due to two still incompletely solved problems—the exact computation of surface friction and the action of the propeller as indicated by its tank model.

The desirability of more extended investigation of the subject of surface friction has long been recognized. The most commonly accepted data on frictional resistance are those derived from Froude's experiments on the *Greyhound*, carried out some fifty years ago. The determination of friction made at that time was by means of planes towed in the experimental tank, the maximum length tested being about 50 feet. It was found that the resistance per square foot decreased as the length of the plane increased, within the limits of the experiment, and it was assumed that this decrease continued up to lengths corresponding to full sized vessels. It seems probable that this assumption is not en-

Generated on 2024-09-12 12:02 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

tirely correct. Froude's calculated resistance for the *Greyhound* did not check exactly the actual measured resistance, being somewhat less, and a similar condition was later found by Dr. Bauer in the towing experiments on the *Cairo*. Moreover it often develops that the resistance, as determined by model, particularly for large vessels, is apparently less than the actual, although the cause has not been definitely determined, owing to the uncertainties of wake, propeller efficiency and other disturbing elements which influence the overall result.

It may be safely assumed that the residual resistance follows very closely the law of comparison, whatever the ratio of model to slip may be, so that, if an error is found to exist, it must be sought in the calculation for the surface friction of the full sized vessel.

This seems to be borne out by recent investigations conducted by Dr. Kempf at the Hamburg experimental tank. The resistances of large tubes, up to approximately 190 feet in length, were very carefully measured with a view to determining the variation of friction with increased lengths of surface and a further and particularly interesting series of experiments was conducted with a tube of smaller diameter, having a section one meter long so arranged as to be free to move in a fore and aft direction. This movable section was inserted in the pipe at various distances from the forward end and the pull upon it, when the latter was moved through the water, measured by a wire leading to weighing apparatus on the carriage. It was found that while the specified frictional resistance increased rapidly for a relatively short distance at the forward end, aft of this it remained practically constant, with the result that, for a long surface, the mean frictional resistance per unit of area was found to be appreciably greater than when calculated by the old methods. Using coefficients and exponents derived from his experiments, Kempf has been able to reach practically perfect agreement between tank and trial trip results.

This new aspect of the problem of surface friction is obviously of much importance and will doubtless demand consideration in future model tank investigations.*

The other gap in the problem of powering a ship may be laid to the still incomplete knowledge of propeller action. The characteristics of model propellers have been very thoroughly investigated, but in the application of the results thus obtained to full sized wheels acting behind vessels, uncertainty exists, as shown by unexpectedly good or bad results which are still occasionally obtained. This state of things arises apparently from the yet imperfect knowledge of wake, as affected by propeller action; and also from the fact that in going from the model to the full sized wheel, the law of comparison apparently does not exactly apply, due possibly to the fact that the total head (atmospheric + hydraulic) is proportionately greater for the model.

With the ever increasing number of trained investigators in the field and with far greater facilities for experimental work than existed a few years ago, it is reasonable to look for the practical closing of such gaps as still exist in our knowledge of resistance and propulsion in the near future. In the meantime, much useful knowledge can be derived from carefully conducted trial trips—for merchant ships, at least, the broadest and most fruitful field of investigation would appear to lie this way.

The natural progress and growth of scientific investigation are steadily increasing the theoretical knowledge of naval architecture and its associated subjects and there are increasing signs that the practical men, who build and operate ships, are coming to realize that study, on their part, of cause and effect, as demonstrated by actual performance, is of equal importance in the process of bridging the gaps which still remain in our knowledge.

*We expect to publish an account of Dr. Kempf's experiments in an early issue.

For the Special Attention of Certain Politicians in Washington

THE following, taken from *Shipbuilding and Shipping Record*, gives an interesting side light on the performance of commercial work in navy yards:

DOCKYARD-BUILT TANKERS

"We must regard as highly significant the financial result of the experiment of the Royal Dockyards in the building of mercantile shipping. It is now officially computed that the loss on the construction of two tankers by the Admiralty for a private firm will be £208,275, or approximately 33⅓ percent of the amount paid by the purchasers of the vessels. A more striking example of the uneconomic intervention of the State in trade it would be difficult to imagine. The Admiralty, through its spokesman in the House of Commons, makes certain qualifications. It is stated that if the overhead charges were deducted the amount would be reduced by approximately £60,000. It is added by Mr. Ammon that the work was given in response to an urgent request to keep the yards employed 'regardless of whether there was a profit or not.' That however, still leaves the significant fact unaffected that a huge loss was incurred. The present Government are, of course, not responsible for the transaction, which occurred before they came into office. They, however, are notoriously wedded to the idea of State participation in industry, and this instance should be a warning to them of the losses to which such courses lead. Many of the Labor Party after the Armistice hankered for the State building and running of ships, and such schemes as the building of these two tankers in the Royal Dockyards won their warm approval. It is well for national finance that these schemes were circumscribed."

The Navy

THE inquiry undertaken by the Secretary of the Navy, as to the relative value of air craft, surface vessels and submarines, can, it appears to us, only result in a reiteration of the major value of surface ships.

Certainly a board composed of naval officers can hardly be imagined as arriving at any other conclusion, but, leaving aside whatever influence training and environment may have upon the board's ultimate action, the weight of all reliable evidence and the opinion of those whose experience best qualifies them to judge are, we believe, unqualifiedly in the support of the surface fleet as the Navy's backbone.

That aerial and submarine craft have a great influence upon the problems of war cannot be denied and this influence will grow, but every conclusion to be deduced from present study as well as the demonstrations of past experience point unequivocally to the essential need of surface vessels and to the fact that, without their support, the effective operation of both the submarine and aeroplane is strictly limited and cannot be decisive.

In the meantime, the painful fact remains that, not only is our surface fleet below the standard assigned to it by the arms conference, but we are woefully lacking in both aerial and submarine craft as well.

Generated on 2024-09-12 12:05 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Consolidation of Services Bringing Results

Time of Ships' Voyages and Vessel Expenses Reduced—Operations More Flexible—Overlapping of Competing Lines Eliminated

By Harold F. Lane

WASHINGTON, D. C.

OFFICIALS of the Fleet Corporation are already noting results in the direction of increased efficiency and economy in the operation of Shipping Board vessels from the consolidations of the various services operated by managing agents which have been effected during the past few months. Twelve of the consolidations worked out by the Fleet Corporation have been accomplished in eight months and the remaining three are to be acted upon very shortly. This covers the entire consolidation program, which President Palmer of the Fleet Corporation refers to as "probably the most constructive piece of work undertaken by the corporation this year. Formerly the Shipping Board had approximately 80 managing agents. This number was cut in two after A. D. Lasker became chairman of the board and the consolidations have still further reduced the number.

The purpose of the consolidations was to put the services on a more business-like footing. Sufficient time has now elapsed for a complete turn-around of vessels of several of the reorganized services and the reports coming in indicate to the officials that the anticipated improvements are already apparent. They feel there can be no doubt that similar satisfactory results will be shown by the more recent consolidations when the final returns covering their performance come in.

The improvements already noted, according to President Palmer, are a reduction in the time of ships' voyages with consequent reduction of vessel expenses, and greater flexibility of operations. Most important of all is the elimination of the condition that existed under which two overlapping lines competed for business on the same route at government expense. The completion of this important work, according to Mr. Palmer, lays the foundation for greatly improved services and insures their further conduct on sound business principles.

ECONOMIES EFFECTED

"Meanwhile, other steps initiated by the Fleet Corporation to obtain improved efficiency have actually resulted in important economies," says Mr. Palmer. "The yearly payroll of the Fleet Corporation alone has already been reduced by over half a million dollars; the stevedoring committees, at home and abroad, have been making considerable reductions; and further great reduction in stevedoring cost will be realized as the final consolidations are put into effect.

"Particular attention has been paid to economy of fuel consumption, and though there is yet much to be done in this line, much has already been accomplished. A conspicuous instance is the great reduction in fuel consumption of the Fleet Corporation's steamship line from San Francisco to the Orient.

"During this period, the treasurer, the auditor and the vice-president in charge of traffic have been sent abroad to investigate conditions and devise methods for improvement of our services and for increased economy on the other side, and definite steps have been taken to secure better return cargoes, in which our ships have been lacking.

"The treasurer's department has revised the methods of disbursements and collections at foreign ports eliminating large losses in foreign exchange and resulting in important economies. For the first time the Fleet Corporation has been able to draw up a detailed budget statement in accordance with usual business practice.

"The corporation has been working for several months on an analysis of data on which to base definite recommendations as to services on the American trade routes and the types and number of vessels adequate to the requirements of our foreign commerce on such routes as are not served by private American lines."

The following is a list of the consolidations now in effect: Trade name, American Merchant Lines; service, N. Atl./E. C. U. K.; agent, J. H. Winchester & Company, Inc. Oriole Lines, N. Atl./W. C. U. K. and Ireland, Consolidated Navigation Company; Mississippi Valley European Line, New Orleans-France and Belgium, Mississippi Shipping Company, Inc.; American Delta Lines, Gulf (excl. Mobile) to East Coast South America, Mississippi Shipping Company, Inc.; Mobile Oceanic Line, Mobile, Pensacola & Gulfport to U. K. and Bordeaux-Hamburg range, Waterman Steamship Corporation; Gulf West Mediterranean line, E. & W. Gulf to Portugal, Spain and North Africa west of Bizerta, Tampa Interocean Steamship Company; Texas Star Line, Texas ports to France and Belgium. Daniel Ripley & Company, Inc.; American Dispatch Line, Gulf (excl. New Orleans) to East Coast South America, Munson Steamship Line; Southern States Line, New Orleans and Texas ports to Holland and Germany, Lykes Bros. Steamship Company, Inc.; American Dixie Line, New Orleans and Texas ports to United Kingdom, United Gulf Steamship Company, Inc. (consolidation of S. Sgitcovich & Company, and Trosdal, Plant & Lafonta); American Premier Line, East and West Gulf to Mediterranean, United Gulf Steamship Company, Inc. (consolidation of S. Sgitcovich & Company, and Trosdal, Plant & Lafonta); American Pioneer Line, N. Atl. and Gulf to Far East and Dutch East Indies, Atlantic, Gulf & Oriental Steamship Company (consolidation of Barber S. S. Lines and Tampa Interocean S. S. Company); American Scantic Line, N. Atl. to Scandinavian and Baltic ports, Moore & McCormack, Inc.

The following consolidations have been recommended to the Shipping Board: North Atlantic to Rotterdam-Bordeaux Range, North Atlantic to Mediterranean, and South Atlantic to U. K. and Europe.

The Shipping Board on August 27 directed the president of the Fleet Corporation to proceed with the consolidation of the Mediterranean services under the Export Steamship Corporation as provided in the board's action of July 2, which action was taken after a conference with the Fleet Corporation representatives and based upon the representations and recommendations made by the president of the Fleet Corporation and his committee on July 2.

Putting it into effect, however, was delayed at the suggestion of President Palmer pending his effort to effect a consolidation of the three Mediterranean operators as one company to which could be allocated the entire Mediterranean service.

It is expected that this consolidation will produce great savings in operation through flexibility and increased efficiency and is in line with the board's general policy of consolidation of services.

The Shipping Board on September 16, after reviewing the matter of the Cosmopolitan-Black Diamond consolidation involving the consideration of the testimony which had been presented to the Select Committee of Congress on the matter, has directed the Fleet Corporation to sever the Cosmopolitan Company from its operation of vessels at Rotterdam, giving the exclusive berth at Rotterdam and Antwerp to the Black Diamond Company, and keeping the Cosmopolitan Company in those ports reaching up to Antwerp.

Generated on 2024-09-12 12:05 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

The decision was reached after consideration of a special report made by Joseph E. Sheedy, vice-president of the Fleet Corporation in charge of the European office. The Fleet Corporation had originally recommended elimination of the Black Diamond and consolidation of the services under the Cosmopolitan.

* * *

Ships Assigned for Grain

The United States Shipping Board at a meeting on September 10 authorized the assignment of additional steamers to assist in the movement of grain and other cargo from Gulf ports to European destinations during the next month or six weeks. The Fleet Corporation has been instructed accordingly and is at present working out plans for making this additional tonnage available to the best advantage.

It was expected that the first of these steamers would be available to load between September 15 and 30.

The grain is now selling at a high price and the board members felt that by putting on additional vessels to take care of the shipments American farmers will be able to realize a maximum profit on this year's crop. The Fleet Corporation had recommended against increasing the number of Shipping Board vessels in the grain export service from Gulf ports on the ground that the grain would be carried at substantial loss.

* * *

Fleet Corporation Orders Economy in Expense Accounts

The following order, effective on all sailings after September 1, has been issued by the Fleet Corporation to managing agents and employees of the corporation:

1. The present tendency of some masters aboard Shipping Board Vessels to submit either extravagant expense accounts or expense accounts which include standard charges for meals, taxi hire, etc., making it evident that they do not represent actual expenditures, has rendered it imperative in the interests of economical operation that corrective measures be instituted, in view of which the following instructions are promulgated for the guidance of all concerned.
2. When it is essential that masters be ashore on ship's business, thereby obviating the possibility of their taking meals aboard, they may charge in their accounts the actual cost of meals purchased not to exceed $3.00 per day, with the further understanding that if less than three meals are taken ashore, the actual cost not to exceed $1.25 per meal will be allowed. The cost of these meals, it will be understood, is to cover also tips to waiters.
3. With regard to taxi service, it must be impressed upon the masters that the corporation will not countenance their use for short distances or where other means of conveyance is available, except in extraordinary instances where the sailing of a vessel before dark or on a certain tide would be prevented, or for similar reasons where it would be disadvantageous to the vessel were other means of conveyance employed. Where taxicabs are hired, the master's account must reflect the date on and points between which travel was made, an explanation as to why other means of conveyance was not employed, the name of the company performing the service and must be supported by receipts where obtainable.
4. Managing agents will be held strictly accountable for any extravagant or excessive items and for any items allowed masters in the settlement of their accounts which do not conform to the requirements previously outlined herein, and all such charges will be disallowed in the audit of voyage accountings unless specifically approved by the district director for the district in which the main office of the managing agent is located.

* * *

Port Differential Investigation

The hearing in the Shipping Board's investigation into the rates, the practices of establishing and maintaining from certain ports like or differentially lower rates than from more distant ports, and the charges, applied and applicable on freight traffic, from North Atlantic, South Atlantic and Gulf ports of the United States, to United Kingdom and other foreign ports, was originally set for September 23 at the office of the board in Washington, D. C., but was later postponed to October 7. At this hearing the respondent water carriers will be expected first to submit evidence with respect to the matters under investigation, and shippers and other interested parties will follow the carriers in the presentation of evidence. Those who propose to attend this hearing for the purpose of active participation therein, are requested promptly to advise H. E. Manghum, examiner, United States Shipping Board, Washington, D. C., of the time desired.

* * *

American Vessels Not Drafting Foreign Seamen

Chairman T. V. O'Connor of the Shipping Board in commenting upon an article appearing in an editorial in the British shipping magazine *Fairplay* of August 28, to the effect that American vessels were drafting seamen from British and other foreign ships, stated that so far as Shipping Board vessels were concerned it was absolutely untrue. Mr. O'Connor stated that as a matter of fact the Shipping Board policy fixed some time ago provided for 100 percent Americanization of all crews on Shipping Board vessels, and under the instructions to the Sea Service Bureau through which our seamen are recruited, American seamen are employed to the entire exclusion of the alien. The character of American seamen now being employed is steadily improving.

That part of the editorial in *Fairplay* referred to by Mr. O'Connor is as follows:

"All shipowners in Europe whose vessels have traded with America have, since the Armistice, suffered in consequence of the desertions which have taken place in the United States, often, it is believed, with the connivance, if not instigation, of the authorities there. Indeed, but for these desertions, it would have been impossible for the Shipping Board to have manned its fleet efficiently."

* * *

Fleet Corporation Survey

The Shipping Board has requested President Palmer of the Fleet Corporation to prepare a report indicating how many vessels and what type of vessel will be necessary in gradually building up the government fleet to a condition where it can carry the major portion of the commerce of the United States. Considerable progress has already been made but in order to make a comprehensive recommendation, according to Mr. Palmer, it is necessary to get together all the available data as to the different kinds of commodities moving to and from the United States ports and to segregate these under the headings of high grade and low grade cargo, with special reference to such as is carried in tramp service, on cargo liners and on combination passenger and cargo vessels. The survey will show what suitable vessels the government has and what types of ships it should have to compete for the ocean tonnage of the country. It will also raise the question of what should be done with the vessels tied up.

* * *

Consolidation of Services from South Atlantic Ports

The Shipping Board, at a meeting held on September 27, considered further the matter of the consolidation of the services from South Atlantic ports to United Kingdom and Continental European ports, and directed that, in assigning the operation of the American Palmetto Line to the Carolina Company, the Carolina Company be instructed that it is the wish and intention of the Shipping Board that the Carolina Company and its officials shall make every possible endeavor to complete such an organization as will equally represent the commercial interests of all of the South Atlantic ports, and will do everything in its power, by seeking financial interests from those ports and placing directors on its board of directors from those ports, as will completely harmonize and protect the local and commercial interests of the whole South Atlantic district.

Generated on 2024-09-12 12:01 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

The Motorship Engineer's Problems

By A. B. Newell

IT is easy, for those who would, to cast a shroud of mystery about the operation of motorship machinery. There are many who would, therefore the inquisitive visitor, if not well posted, may leave rather awe-inspired and with a profound respect for the men who have mastered the operation of this strange and apparently complicated equipment.

To make a clear comparison revealing the relative complication of this new type of machinery and that of a steamship does not present the problem confronting the operating engineer who wishes to take up motorship work. In all branches of mechanics we find machinery becoming more complicated but requiring no more skill for its handling. I once mentioned to an old steam engineer what it pleased me to term "the present day problem of lubrication." He smiled and said, "Son, you don't know what lubrication troubles are. I have seen them eliminated, and mighty glad I am, as I think of the days when we used to swab the rods with tallow and use animal fats and vegetable compounds on the bearings." He was right. Lubrication was a problem, but we have it well in hand today. New types of machinery may be more complicated, yet more dependable and easier to handle for with new problems arising old ones are passing.

Every piece of machinery found on a motorship is the result of an evolutionary development. It is the outcropping of new ideas suggested by old. Seldom is anything entirely original, hence the striking similarity to standard reciprocating steam engines found in many oil engines. This similarity should help in simplifying matters, and does, except for some men who are not quick to grasp things and feel that any departure from former methods constitutes a complete change in all things involved. Where powers of association are thus dormant it is probably best to get in a rut and stay there. Some ruts are long but lead to the same place as the short cuts.

The marine steam engineer is the natural recipient of offers to train for motorship work. While this is a just, and in most instances, wise procedure, it does not necessarily follow that he will be the future motorship engineer to the exclusion of all others. He should adjust himself to the thought of finding other men following the sea in the engine room—men with no fine knowledge of steamship work, yet thoroughly capable aboard a motorship.

To the steam engineer who hopes to make the change I wish to give an idea of the comparative merits of the two similar, yet different, kinds of work.

Steam and Diesel Work Compared

The Diesel motor is in no sense of the word similar to an electric motor. Motor is hardly the word, engine expresses it better. The slow turning types are huge bulks of machinery, much heavier than any steam engine of the same power. Those for ship propulsion often weigh as much as a triple expansion engine and Scotch marine boiler filled with water, yet develop no more power than the engine and boiler.

To take care of upkeep, routine work is necessary and often amounts to as much as the boiler work on a steamship. It is different, however, for the dirty and heavy boiler work can be done with firemen and water tenders under the supervision of an engineer. The equally dirty and heavy work on a motor must be done by the engineer with the assistance of oilers and wipers. It is work requiring mechanical skill. The great similarity lies in the fact that on neither type of ship does it seem that all work is finished—it never ends. Neither type of ship is any place for a lazy man.

The motorship offers a place for the steam engineer when his ship bows to the inevitable march of progress. It has a welcome, redeeming feature—unbearable heat is seldom known and comfortable working conditions generally exist.

Some engineers with experience on both types of ship declare the motorship to be a veritable workhouse. Some, but not all, are just that. Let us remember that some steamships come under that category.

It may be possible to train the oilers to do some of the work of a mechanical nature, while not "muling"—of which there is a plenty. With quick turn-arounds it may be possible to hire help from shore, i.e., mechanics from a repair shop.

Naturally the motorship owner is no more anxious to pay repair or labor bills than is the steamship owner. As for depending on the oilers to lend much assistance in port, most of us who follow the sea know that sailors will be sailors. They will seek and find an occasional slack-tub in which to quench their burning thirst, even in arid America, while on foreign strands they will find, without seeking, rivers of running "red eye."

To dress them in fancy names such as senior and junior motormen, in place of oilers and wipers, does not help. Before we were invested with responsibility, some of us may have bent the elbow once too often or fallen prey to the wiles of a foreign iniquity in petticoats, leaving the first assistant to sweat and curse us and fight his battle alone. It happens on motorships that way too.

Seafaring in the engine room of a motorship then resembles that on a steamship. The watch is not done without trials, for with conditions never too perfect, there is always something to do. We welcome the sound of the hammer on the old bent bar and the watch that comes to relieve. Having just finished up and left nothing undone, we hope to find things as we left them when we come on again.

As for being able to grasp the fundamentals and learn the new work (only partly new, in fact), that is not too difficult and no mystery enshrouds it. Plain common sense and a willingness to do and be shown, coupled with a natural bent toward sea mechanics is all that is needed.

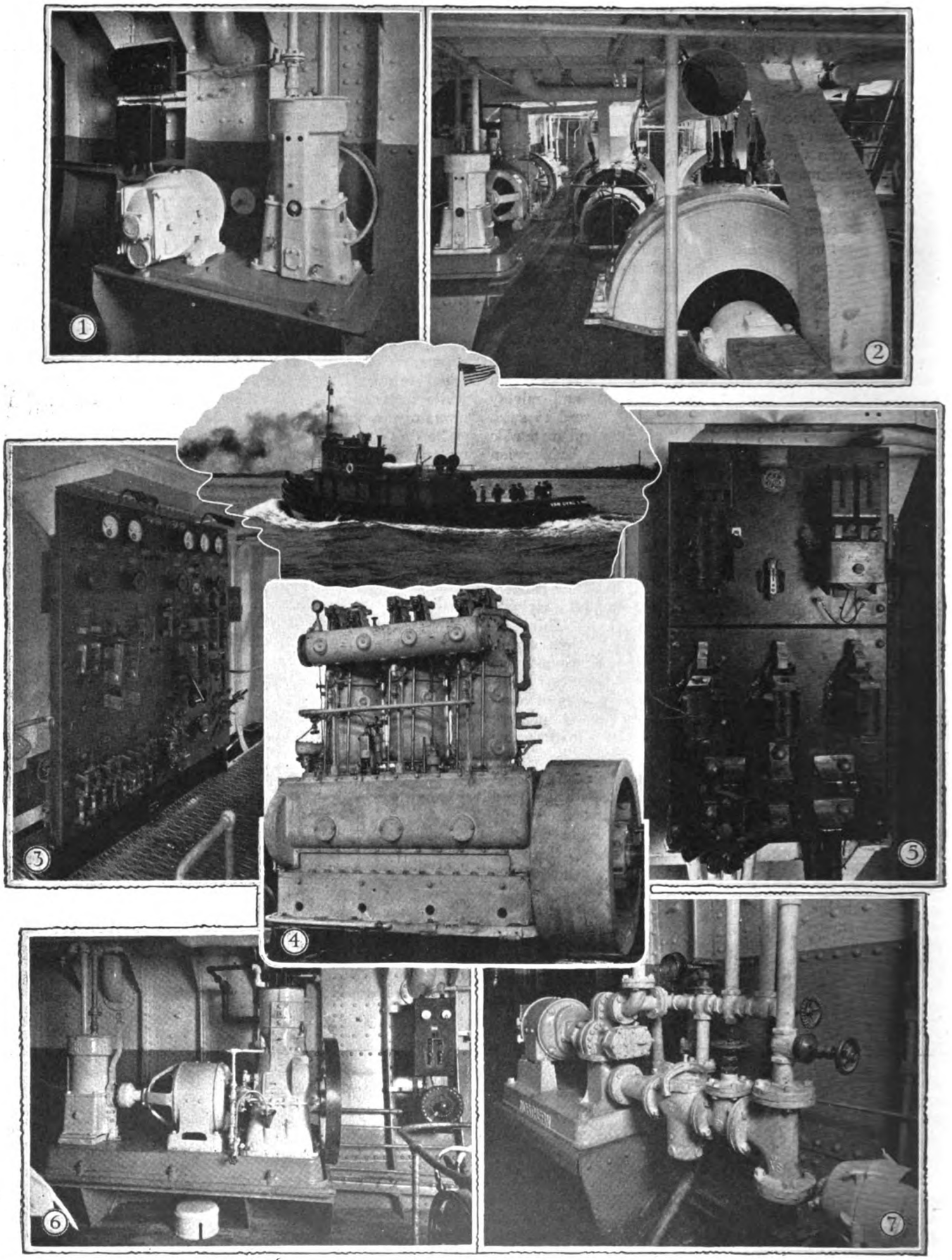
More Training Needed for Licensed Berths

I must not be misleading, however. The three months which the U. S. Steamboat Inspection Service requires the steam engineer to serve is not enough to fit the average for a senior berth. It would take an exceptional man to fit himself for a third assistant berth in three months. A year of training for a first assistant and a year and six months for a chief, if they hold such grades of steam license, is none too much for the average and not enough for some. They may be getting this training as a junior or third assistant engineer.

Experience has taught many who have gone through the mill that what I say is true and it will teach many who are to follow. And when they learn, bear in mind that good men they will be.

Management Week.—"What is the amount of clerical help required to do a specified amount of business?" This forms one of the problems in budgeting for better office management which will have the attention of some of the nation's keenest business minds during Management Week, October 20-25. Committees in 65 of the most important cities of the United States and Canada are definitely planning to hold meetings this week devoted to management problems. The American Society of Mechanical Engineers, The American Management Association, The National Association of Cost Accountants, The Taylor Society and The Society of Industrial Engineers are cooperating in these meetings.

Generated on 2024-09-12 12:01 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN



Figs. 1-7.—Diesel-Electric Tug Van Dyke 3: (1) Motor Driven Air Compressor; (2) Engine Room, Looking Forward; (3) Main Switchboard; (4) One of the Main Engines; (5) Auxiliary Switchboard; (6) Auxiliary Generator and Air Compressor Driven by Oil Engine; (7) One of the Motor Driven Bilge and Circulating Pumps

Generated on 2024-09-12 12:01 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

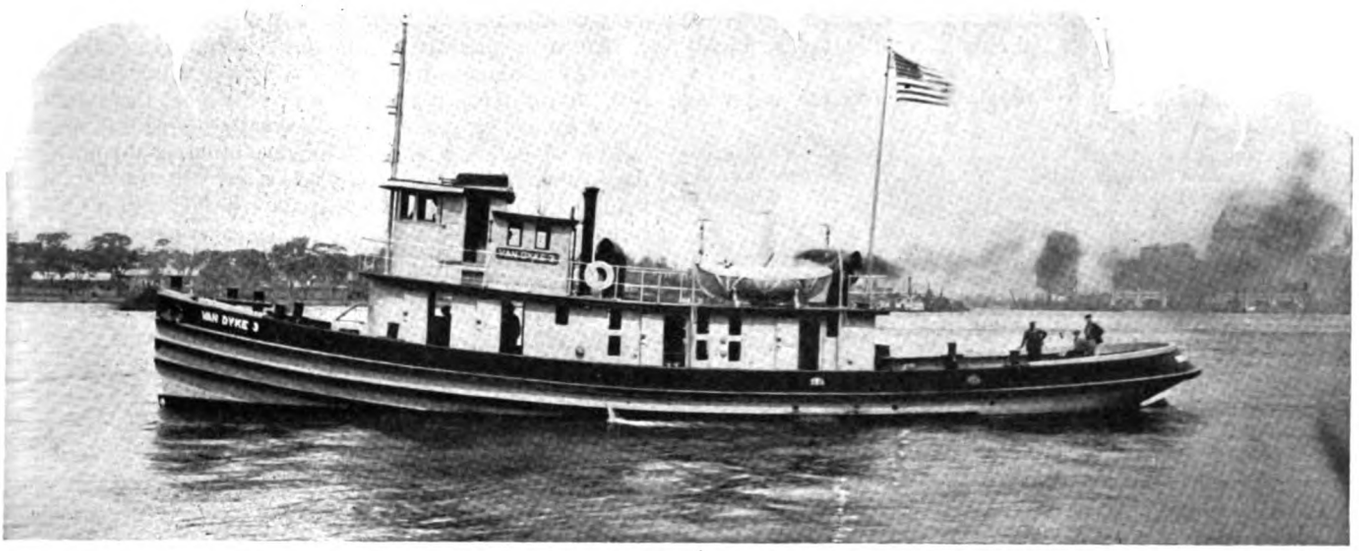


Fig. 8.—Diesel-Electric Tug Van Dyke 3

The Diesel-Electric Tug Van Dyke 3

Atlantic Refining Company Adopts Diesel-Electric Drive on New Tugs—Two Tankers to Be Converted

ALTHOUGH the application of the Diesel-electric drive to ordinary cargo ships may still be the subject of argument, pro and con, the advantages to be derived from its use in tow boats and in vessels where relatively large amounts of power are used for other purposes than propulsion are so great as to have called for the unqualified approval of practically every unbiased and competent observer of its performance.

Particularly is this the case with tugs; the more than satisfactory performance of such of these vessels as have already been fitted with this type of machinery indicating the probability of its very general adoption in this class of vessels at no distant date.

Electricity lends itself to great advantage in tow boat service, not only because of the very remarkable facility in handling and maneuvering derived from its use and its relatively high efficiency of propulsion over a wide range of speeds, but also from the fact that most tugs, particularly those employed in harbor service, are regularly called upon to furnish considerable power for other purposes than propulsion and towing alone; i.e., for operating large wrecking and fire pumps of their own and also for supplying power to other vessels for similar purposes, notably for pumping out tank barges.

The use of the Diesel-electric combination on tow boats is well past the experimental stage and may be said to be firmly established although the number of installations is naturally not yet large.

The most comprehensive program of Diesel-electric installation which has come to our attention is that of the Atlantic Refining Company of Philadelphia. This company has the system already in operation on three tugs, the *Van Dyke 1*, *2* and *3*, and the work of installing it on the tankers *Anahuoc* and *Allentown* (to be renamed *J. W. Van Dyke*) is just commencing.

The task of planning and carrying out this progressive, as well as extensive, engineering work is in the hands of Mr. Lester M. Goldsmith, engineer of the Atlantic Refining Company, to whom we are indebted for the following particulars of the *Van Dyke 3*, which recently was given an exhibition run in New York harbor and is now in service.

As will be seen from the photographs and plans, the *Van Dyke 3* does not differ essentially

Generated on 2024-09-12 12:03 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

in general arrangment from the average, medium sized, steam tug, the most noticeable difference, so far as general appearance is concerned, being the absence of a smoke stack. It should be noted, however, that the vessel has an unusually fine model, considerable deadrise and a very clean run—all of which undoubtedly contributes materially to her highly satisfactory performance.

The hull is constructed of steel and has the following principal characteristics:

Length overall	97 feet 0 inches
Length between perpendiculars	87 feet 0 inches
Breadth, molded	21 feet 0 inches
Depth, molded	11 feet 6 inches
Designed draft	9 feet 6 inches
Block coefficient	0.48
Deadrise	3 feet 6 inches

The propelling machinery consists of two Ingersoll-Rand four-cycle "PR" oil engines of 225 brake horsepower each, directly connected to a General Electric direct current generator of 155 kilowatts capacity and a 26 kilowatt exciter on the same shaft and operating a single armature propelling motor of 375 horsepower at 120 revolutions.

Fig. 4 shows one of the engines. It has three cylinders 15 inches in diameter by 20 inches stroke and develops its rated 225 brake horsepower at 257 revolutions. Solid direct injection is used, a single fuel pump (at left of center cylinder) supplying all three cylinders by means of a central distributor which appears at the left side of the photograph. A split type of flywheel is used, with a very long hub which forms the coupling to the separate generator and exciter shaft. The engine foundation is unusually heavy and the engines are bedded on type metal instead of the customary chocks, making a very rigid foundation and producing a practical absence of vibration when running, as clearly demonstrated by Fig. 10 which is a time exposure.

The main generators, each operating at 125 volts at full power, are connected in series, the total voltage thus being 250. With one generator only in operation, the revolutions of the propelling motor would normally be reduced one-half, but the propeller, at this rate of revolution, could not absorb the full power of the single generator. By weakening the field of the motor, its revolutions are brought up until it absorbs the full power of the single generator and, by this means, it is possible to obtain a speed of 10 knots with but one engine in operation.

The generators are controlled by the Ward-Leonard system of variable field excitation. The operator in the pilot house thus has to handle, in maneuvering his vessel, only the excitation current, which has an amperage about equal to that of an ordinary lighting circuit, in contrast to the arrangement, sometimes used, of having the controller in series with the main motor and, in consequence, having to handle the full load current. Reversal is obtained by reversing the excitation of the generators.

When the generators are used for driving the fire pump or operating pumps on a barge alongside, the Ward-Leonard system is disconnected and fixed excitation applied so that they operate at constant voltage, the same as an ordinary stationary generator, the current being supplied to the barge,

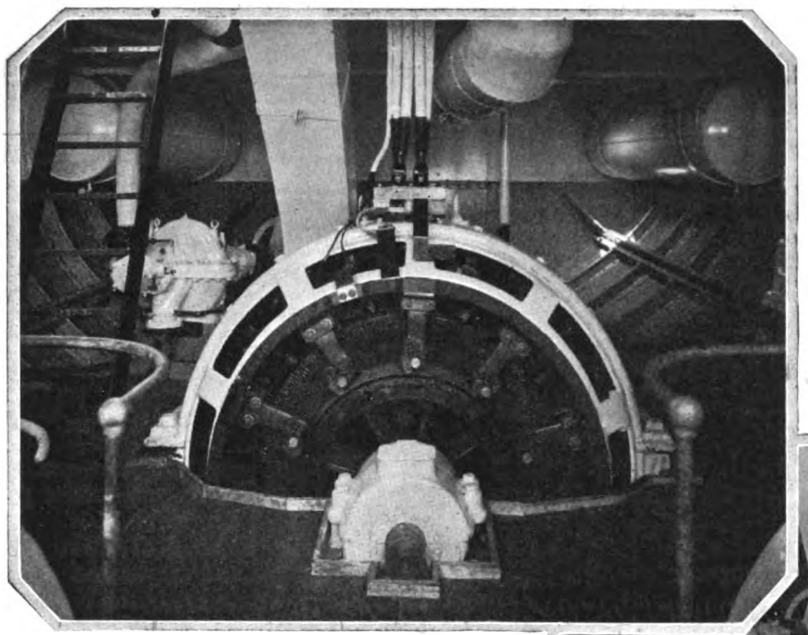


Fig. 10.—The Photograph Below Is a Time Exposure of the Propelling Motor When Running at Normal Speed

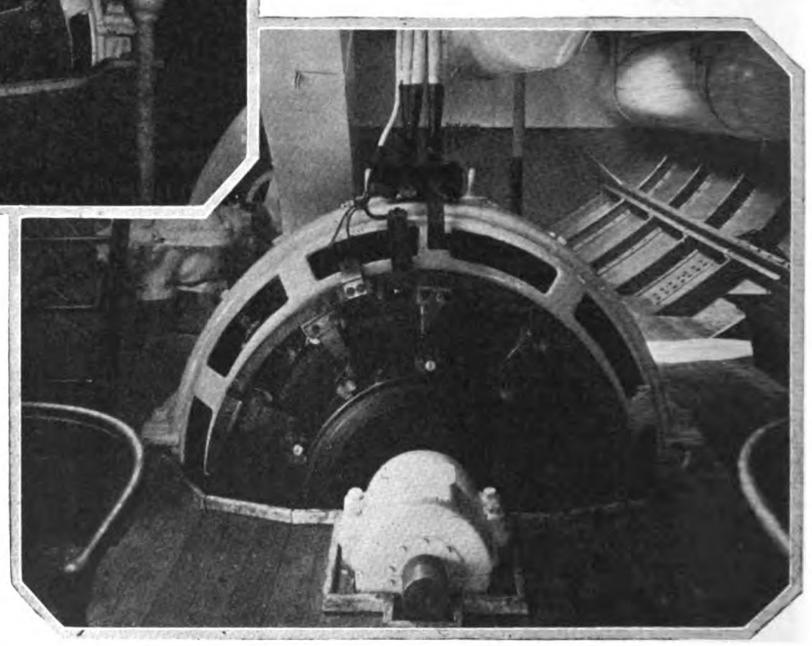


Fig. 9.—The Photograph Above Shows the Propelling Motor When Not in Operation

Generated on 2024-09-12 12:03 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

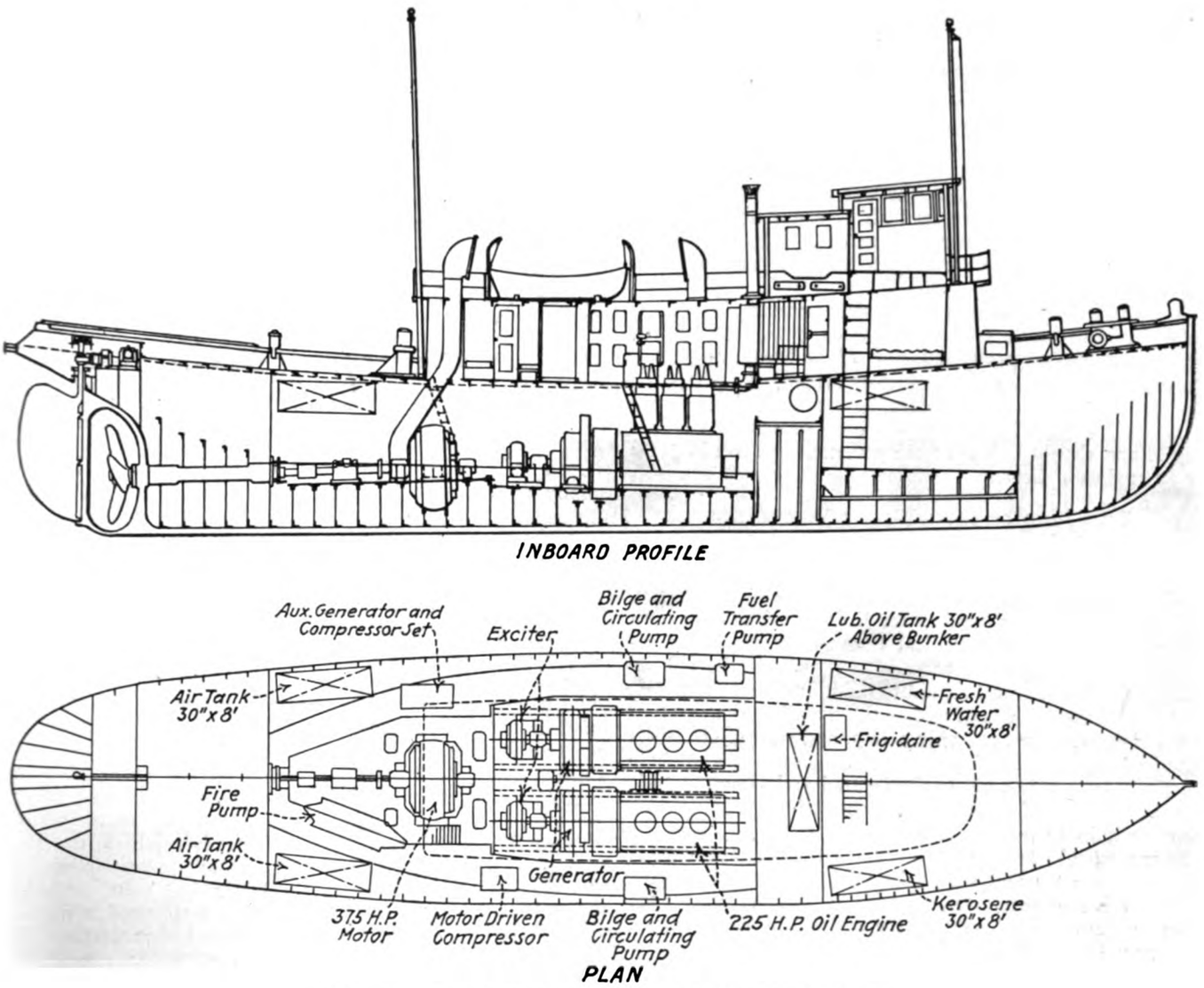


Fig. 11.—General Arrangement Plans of the Van Dyke 3

from either generator, through plugs in the ship's side and cables. In this way the barge pump is directly controlled from the tug. Fig. 5 shows the switch panel used for effecting these connections. The fire pump is a two-stage Cameron centrifugal, also made by the Ingersoll-Rand Company, having a capacity of 1,000 gallons per minute at 85 pounds pressure. It is driven by a 75 horsepower motor, running at 1,750 revolutions per minute.

It is possible for this tug to tow a barge alongside of a moving vessel and at the same operate the cargo pump of the barge to bunker the large ship or supply feed water.

All auxiliaries are driven from one exciter, the other acting as a standby. Mechanical interlocks in the switchboard prevent one exciter switch from being thrown in when the other is already in operation. Further interlocks prevent the starting of the propelling motor when the generators are running under fixed excitation or fixed voltage.

Turning to the remaining illustrations, Fig. 1 shows the motor-driven automatically controlled starting air compressor; Fig. 2, a general view of the engine room with the propelling motor in the foreground, the port main generator and the auxiliary engine-driven generator and air compressor at the left; Fig. 3, the main switchboard; Fig. 6, the auxiliary set, comprising a 6 horsepower Bates & Edmonds "Bulldog" Hvid type oil engine, a 4-kilowatt generator and a 4½-inch by 5-inch air compressor; while Fig. 7 shows one of the two Northern bilge and circulating pumps driven by a 3 horsepower motor. Fig. 9 shows the propelling motor at rest and Fig. 10 the motor in operation. The absence of vibration, indicated by the clearness of the fixed parts of the motor, is notable.

The boat is heated by an electric-vapor system, current being supplied by the exciters. Cooking is done by kerosene stoves and a Frigidaire electric refrigerator is installed.

Two propellers were designed each by a noted designer so that a study could be made of propellers in general and their widely different designs in particular. The propeller is of the built-up type, having four high tensile bronze blades. This type was adopted in order that the pitch might be varied to meet different service conditions.

The hull of the *Van Dyke 3* was built, and the machinery installed, by the Staten Island Shipbuilding Company, Mariners Harbor, Staten Island, New York.

The first of these Atlantic Refining Company tugs has now run nearly 6,000 miles and has given her owners the greatest satisfaction, proving superior, in every way, to steam propelled tugs of twice her horsepower rating. The owners contemplate carrying out exhaustive dynamometer tests of two electric tugs, a direct drive Diesel tug and a steam tug, of the same rated power, during the coming winter. These tests will be watched with great interest, not only as affording a comparison of direct and electric drive but also for the comparison of an ordinary tow boat propeller and the variable pitch wheel above mentioned.

Generated on 2024-09-12 12:03 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

What Fits Men for Work in the Engine Room?

By David Gaehr*

IN a previous article, it was pointed out that *changed conditions,* especially since the war are responsible for a general lowering of ideals, both personal and national, and *make it imperative to engage in a very definite recruiting activity* in order *to secure good men for our merchant marine.*

Any United States citizen (or a man earnestly planning to qualify as such), at least 18 years old, endowed with a sound physique, being of good character, of at least average intelligence and able to give satisfactory evidence as to sticking to a program undertaken by him, is worth taking a chance on as likely material to develop into an engineer. *Citizenship* is and should be one of the governmental requirements for an engineers' license.

The Kind of Men Worth Developing

Unfortunately the government does not as yet lay sufficient stress upon the *physical fitness* of men applying for licenses. Only eyesight and hearing are tested in connection with some of the examinations for licenses. The only compulsory provision along medical lines at present is the requirement that applicants for new licenses must be able to pass an examination in first aid to the injured, and that first aid cabinets are to be kept on board. This is a definite step in the right direction, but only a step, and not yet efficiently organized to enable men possessing sufficient knowledge to effectively render first aid to the injured and to act authoritatively in cases of emergency, since men already licensed are not required to take such examination.

Seamen should be free from organic troubles and serious anatomical defects and should be robust men, with reserve strength. No human derelicts, who by their very presence aboard endanger the health of the rest of the crew, should be shipped on a vessel.

It is hard to correct faulty home training. What a wonderful help it is to a young man, if he has cultivated a sense of order and orderliness, if he is well disciplined, respects authority and is able and willing to obey orders courteously and willingly! Although it is not considered "good form" to allude to religion or politics in any discussion of business, trade or technical matters, we all know and have been profoundly impressed by the fact that any man who has no religious convictions usually has no other kind of conviction to rule his conduct in any direction; hence, he is not a desirable employee.

It is distressing to note how even our government treats questions of personal hygiene almost exclusively from the physiological and pathological standpoint, akin to the treatment accorded a heard of cattle, ignoring almost entirely the value of education and appeal to conscience and manhood as effective preventative means. Without proper ideas and convictions on this subject, there can be no such thing as "character," without character no self-respecting manhood and without true manhood no real worthy soldiers or sailors or any kind of craftsmen.

Our new recruits starting in as coal passers, or firemen, must have sufficient strength of character to be able to live with men, who are not ideal "timber" for good American sailors. As to *intelligence,* a desirable embryo engineer ought to give evidence of mental alertness, a fair power of observation and a reasonably good command of the English language, not only in speaking but also in reading and writing, and a good, common school education. Rightly taken, fine mental training stands one in good stead in the performance of even the most humble tasks. A man with a keen mind may even now find better ways of "passing coal" or of firing, than those followed for years by shipmates, although it is the part of wisdom to refrain from suggesting changes or from instituting reforms until one is entirely sure of the ground and can demonstrate personally how better results may be obtained with the same effort. In brief, the first step to assure success and promotion in a sea-faring career is to "lick oneself," lest the shipmates must perform this necessary operation, and that can best be done by forcing oneself to do distasteful and unpleasant, though honorable work, in line with duty.

*In charge of School of Marine Engineering, Lake Carriers' Association, Cleveland, O.

What a Prospective Engineer Ought to Learn First

More than anything else the prospective engineer, starting at the bottom, needs to learn to *"keep his month shut and saw wood,"* i.e., listen attentively and respectfully to orders issued by superiors, obey these orders concisely and diligently and be very observing of what is going on about him.

After carefully observing the various members of the crew, particularly of his department, and reflecting on their attitude during a reasonable length of time, he ought to *cultivate the friendship of one or two men,* obviously his superiors in experience, at least, who are likely to be an inspiration to him. One does not need many friends in life. One or two men of big heart, sound judgment, backed by long and varied experience, splendid character and masters of their life work, form one of the most potent influences a young man may place himself under, for encouragement and timely advice, and most young men require a confidant, who will "place their heads back upon their shoulders," after some bitter experiences have "taken the starch" out of them.

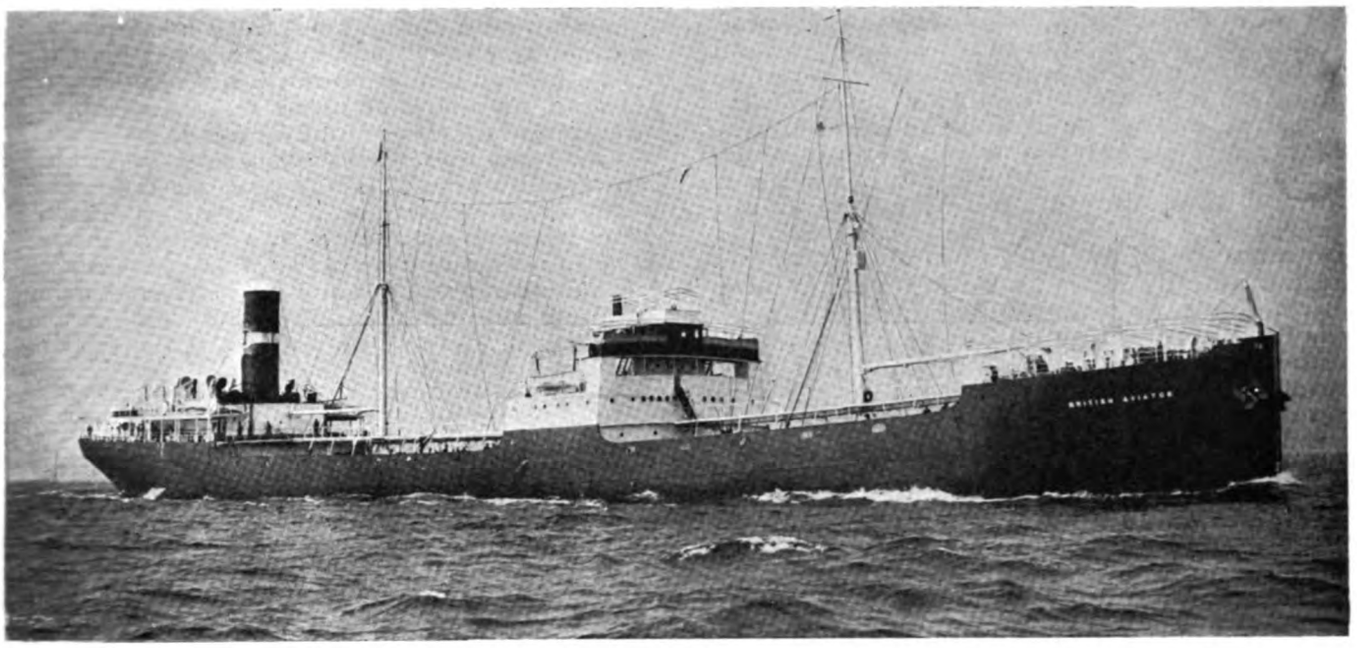
Next in importance, after having learned to do the assigned tasks satisfactorily, is to get an understanding of the *relation of* that *work to* the larger and more complex task of *running* the *ship,* i.e., the power plant driving it. That involves a general idea of the method of propulsion, of thrust, steam generation, starting with a simple study of combustion and being able to trace the course of the gases through the furnaces, tubes, uptakes and stack, as well as the course of the steam through the plant. That "friend" may aid greatly in acquiring this elementary knowledge, and objection is never raised, when an interested fireman or coal passer, while off watch, wishes to go into the engine room and, without getting into anyone's way, quietly look on and observe.

A Definite Plan Must be Followed

Satisfactory progress in self-improvement is never made, unless a specifically outlined course is pursued. The young man starting in as coal passer or fireman, hoping to qualify for an engineer's berth, should, after having served thirty-six months in the engineers' department of a steam vessel, have a pretty clear notion of what knowledge he ought to acquire and he must try to make *daily* advances toward that goal. The "habit of study" must be formed and the "power of observation" must be persistently developed, i.e., the faculty to see many things at a glance and then "reason from cause to effect" in the earnest effort to understand the purpose, the construction and the operation of what was seen.

One must bear in mind that promotion does not come on the basis of the rate of acquiring book knowledge but on how valuable a man is to his employer and whether he gives promise of being equally valuable in a more responsible position. Hence the young prospective engineer must be deeply concerned about making himself *distinctly useful from the start* and be willing to be rated on *what he accomplishes.*

Generated on 2024-09-12 12:05 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN



The 10,000-Ton Tanker British Aviator Equipped with a 3,000 Brake Horsepower Camellaird Fullagar Engine

Large Motor Tankers Under Construction in Europe

Deadweight Tonnage Totals Nearly 300,000—The British Aviator, Built by Palmers, is Equipped with the Highest-Powered Camellaird-Fullagar Engine Yet Built

By Our Special London Correspondent

IN various European shipyards, there are now in course of construction about 25 large tank ships, in which oil engines are to be installed, the total carrying capacity of these vessels being between 250,000 and 300,000 tons deadweight. It is significant as showing the favor with which the oil engine is now viewed by tanker owners, that the tonnage of steam tankers, being built, is not more than half that of similar vessels to be equipped with internal combustion machinery. In addition, three big and modern steam tankers equipped with oil-fired boilers and belonging to the Standard Oil Company, are to be converted by Krupps of Kiel, and when all these new vessels are completed, it may have a distinct influence upon the oil freight market, in view of the low cost of operation.

Largest Motor Tanker So Far Built in England

The biggest motor tanker that has yet been constructed in England, was completed in August. She is named the *British Aviator* and has been built for British Tankers, Ltd., which is responsible for the transport of all the oil produced by the Anglo Persian Oil Company, in their Persian fields. A sister ship has been ordered, while a third vessel, the *British Motorist,* was recently launched, although in this craft different machinery will be employed.

The *British Aviator* is chiefly notable for the fact that she is propelled by the highest-powered engine of the notable opposed piston Camellaird-Fullagar type that has yet been manufactured. Curiously enough, it has not been constructed by the originators of this type, Messrs. Cammell Laird & Company, but by one of their licensees, Palmers Shipbuilding & Iron Company, the well-known Tyneside firm. It is designed to develop 3,000 brake horsepower when running at 100 revolutions per minute.

Main Particulars of the British Aviator

The following are the leading particulars of the new tanker:

Length between perpendiculars	440 feet
Length overall	454 feet
Beam	57 feet
Depth	33 feet 11 inches
Displacement	14,600 tons
Deadweight capacity	10,200 tons
Speed	11 knots
Brake horsepower	3,000

There are ten oil tanks and the engine room is as usual arranged at the after end of the ship. There is a pump room amidships in which are installed the two steam-driven pumps each with a capacity of 325 tons per hour, supplied with steam from two Scotch boilers, 11 feet 6 inches in diameter and working at 150 pounds per square inch. The interesting plan is adopted of passing the exhaust gases from the propelling engine around one of the boilers, so that it is hoped sufficient steam will be raised while the vessel is at sea for the requirements of the steam-driven auxiliary plant. This is largely experimental, as similar arrangements adopted on previous ships have not been wholly successful.

Machinery Weights and Space Reduced

The engine is of a type that should prove of interest to American shipbuilders and shipowners, as it would presumably be suitable for employment in some of the larger ships to be converted under the U. S. Shipping Board's program. For its power, it is less weighty and occupies considerably less space than four cycle machinery, and also less than the majority of other two cycle engines. It has six cylinders, each cylinder having a diameter of 23 inches, while the pistons have a stroke of 36 inches so that the combined

Generated on 2024-09-12 12:01 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

stroke in each cylinder is 72 inches. Engine room length is saved by arranging the necessary scavenging pumps at the top of each cylinder. They are rectangular in section, and although not an essential feature of the Camellaird-Fullagar design, it has been used on all engines hitherto built.

Each pair of cylinders is cast together in one unit, according to the standard Camellaird-Fullagar design which is now fairly well known. It will be remembered that the upper crosshead of one cylinder of each unit is coupled to the lower crosshead of the adjacent cylinder by diagonal rods, and a cushioning effect is thereby obtained. There is no bearing between the cranks of each pair of cylinders and this is the main reason why the length of the engine is relatively short. A somewhat unusual feature of the arrangement is that the propelling motor is entirely self-contained, driving not only a four stage air compressor at the forward end of the main crankshaft but also a lubricating pump and separate cylinder and piston cooling pumps, fresh water being utilized for both the pistons and the cylinders.

MANEUVERING

Starting and maneuvering are accomplished by means of one large handwheel. If this is turned to the right, it actuates the servo motor which moves the camshaft operating the fuel and starting air valves, bringing them in the correct position for ahead running. Continued movement of the same handwheel admits starting air, then throws two cylinders on fuel, next four on fuel, and finally, all six on fuel oil, when the air supply is cut off. For astern rotation, the handwheel is merely turned to the left and the same operations are carried out. There are two other handwheels, one for controlling the speed by acting on the suction valves of the fuel pumps and the other modifying the lift of the fuel valves so as to give greater flexibility at low speed.

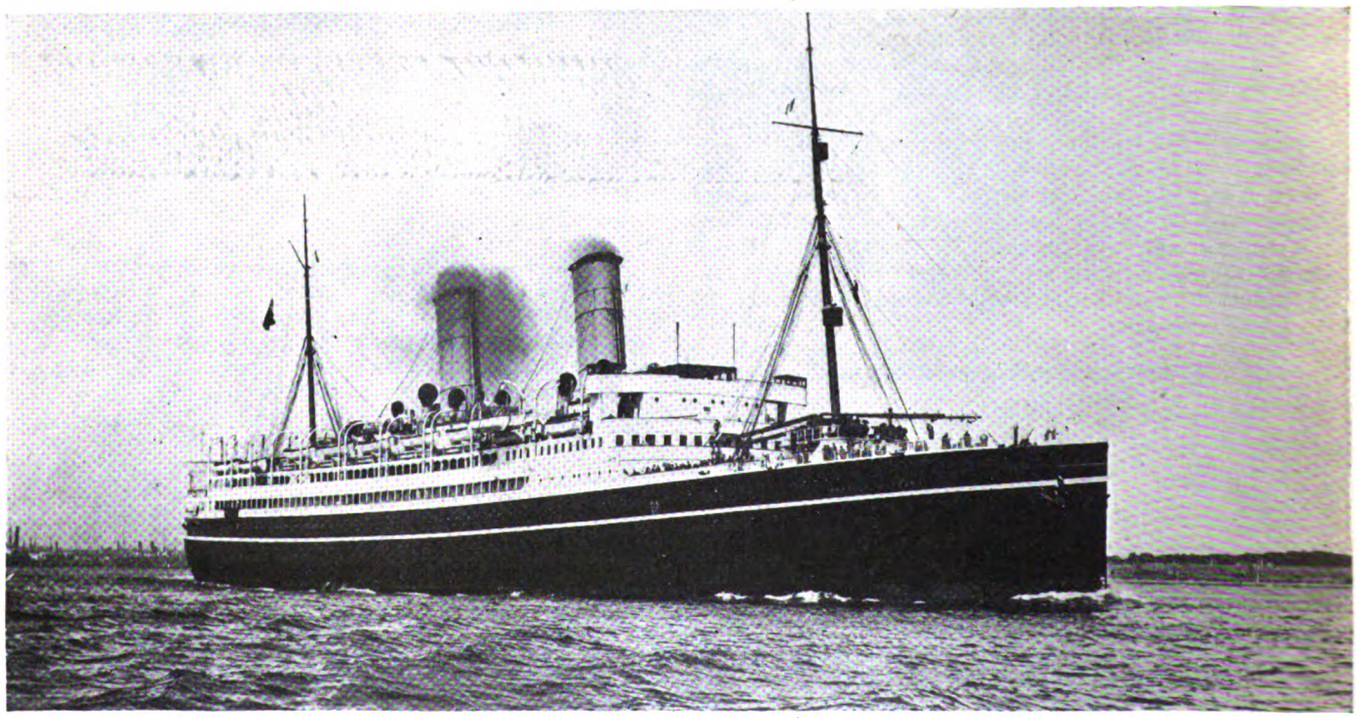
TRIAL RESULTS

On trials, it was found that the consumption of this engine worked out at slightly under 0.4 pound per brake horsepower hour at full load, which is a very satisfactory result. The mean effective pressure is somewhat lower than the normal, being about 68 pounds per square inch, while the mechanical efficiency is about 72 percent.

In the engine room, a certain number of the auxiliaries are electrically operated, the power being supplied from two Swedish Polar Diesel engines of 90 horsepower running at 300 revolutions per minute and driving 60-kilowatt dynamos. Following an example which has lately been adopted in several British motorships, a centrifugal separator is installed, not only for purifying the lubricating oil but also for cleansing the fuel oil.

STANDARD OIL ORDERS MOTOR TANKERS IN EUROPE TOTALLING 100,000 TONS

It is probably not too much to say that European tanker owners, in placing so many orders, as they recently have done for oil-engined, oil-carrying craft, have been largely influenced by the numerous contracts which have been fixed with European yards by the Standard Oil Company, for big ships of this type. Many of these Standard Oil tankers will be particularly interesting vessels, and it is understood that two of 12,000 tons, for which they have contracted with the Vulcan Works of Hamburg, will be equipped with Diesel engines operating in conjunction with the Vulcan system of hydraulic clutches and mechanical reduction gear. Among the several big tankers which Krupps are building for the Standard Oil Company, two are of 15,000 tons in which a new type of Krupp two stroke engine will be installed adopting a system of valve scavenging, while in a smaller vessel which is being built for the Standard Oil Company, at Nantes in France, an 1,800 brake horsepower Sulzer engine will be fitted. Altogether it is estimated that the Standard Oil Company has placed contracts in Europe for motor tankers totalling approximately 100,000 tons deadweight.



S. S. Empress of France, Built by Beardmore and Company, Dalnuir, Scotland, for the Canadian Pacific Steamships, Ltd., on Her Trial Trip, When She Attained a Speed of 19½ Knots With an Oil Fuel Consumption Well Within the Guaranteed Figure of 1.05 Pounds Per Shaft Horsepower Hour for All Purposes. The Vessel Will Sail from New York on January 14 on a Round the World Cruise

Generated on 2024-09-12 12:14 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

The Worthington Double Acting Diesel

Further Details of the New Worthington Double Acting, Two Cycle Diesel Engine

LAST month we published an outline description of the new Worthington double acting Diesel engine, including a sectional drawing which gives a clear idea of its general arrangement and the several novel and important features which are incorporated in the design.

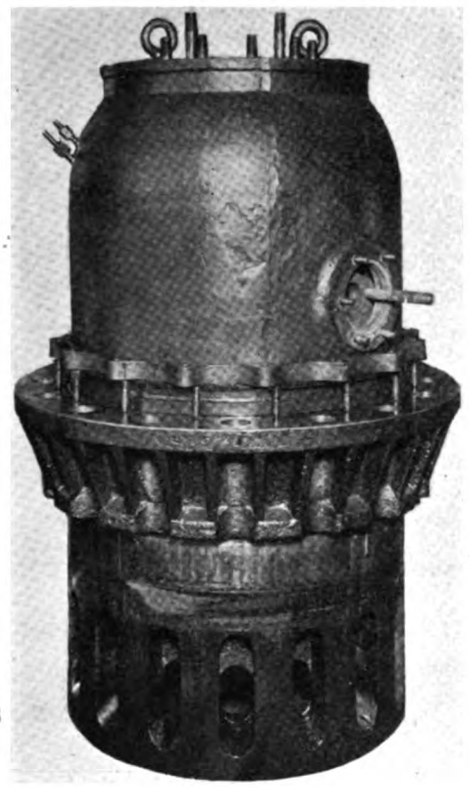


Fig. 1.—Cylinder

We are now, thanks to the courtesy of the builders, enabled to publish a number of excellent photographic reproductions which give a clear idea of some of the details of this remarkable machine.

The most outstanding point in the design of the Worthington engine and the one in which it differs most materially from other Diesels, lies in the construction of the cylinder. As we have often had occasion to state, the limit of power in a Diesel cylinder is fixed by its ability to transfer heat. In the Worthington cylinder a thin cast iron liner to take the wear of the piston, and which also contains the scavenging and exhaust ports, is closely fitted into a wrought steel jacket which takes care of the stresses. This steel jacket, owing to its relative thinness, offers little obstruction to the passage of heat from the interior of the cylinder to the cooling water circulating outside of it. It is therefore possible to develop greater pressures and powers than could be withstood by an ordinary cast iron liner of the same diameter, or conversely, cylinders of greater diameter

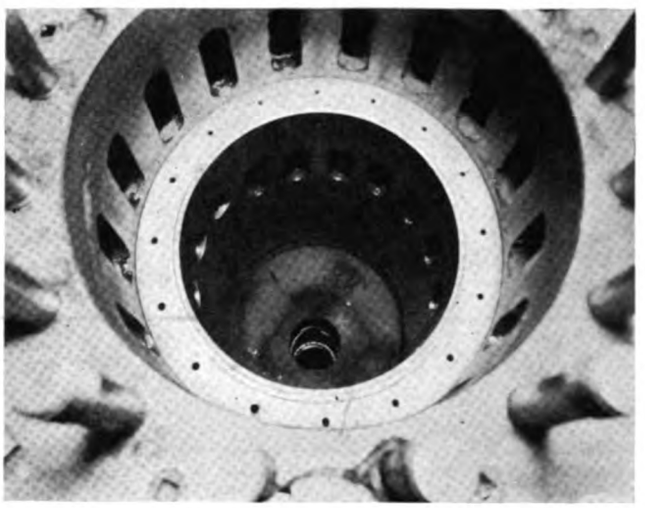


Fig. 2.—Looking Down Into the Cylinder

may be successfully used without the danger of too intense a heat action upon their bores. In Fig. 1, showing the upper cylinder removed from the engine, the lower part of the steel jacket appears just below the heavy central bolt flange, with the lower end of the liner and ports at the bottom.

Fig. 2 shows the interior of the lower cylinder and the upper cylinder, the piston and rod (Fig. 3) having been removed. In passing it may be stated that the entire time consumed in removing these parts and giving access to the lower cylinder, as shown, was less than 1½ hours. It should be further noted that the part of the piston rod exposed to combustion does not enter the stuffing box and that apparently the only effect on the rod is a slight discoloration immediately below the piston.

In Fig. 4, the door at the back of the engine has been removed, exposing the connecting rod and crosshead. The bob weights appearing at the bottom are only fitted to the

Fig. 3.—Piston and Rod

Generated on 2024-09-12 12:14 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

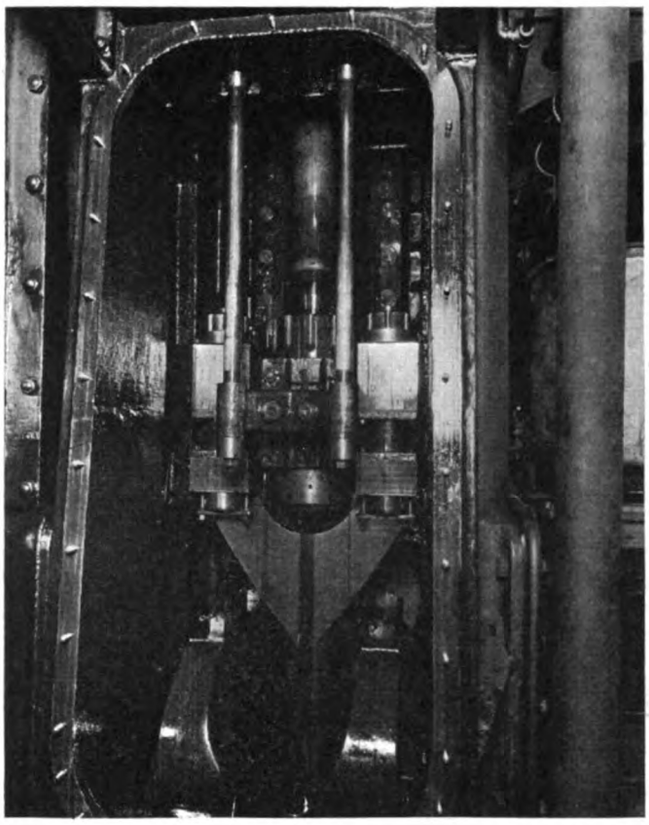


Fig. 4.—Crosshead and Connecting Rod

cranks of the single cylinder unit. In the final, multi-cylinder engine, they will be omitted as unnecessary.

The fuel pump is shown in Fig. 5, the governor appear-

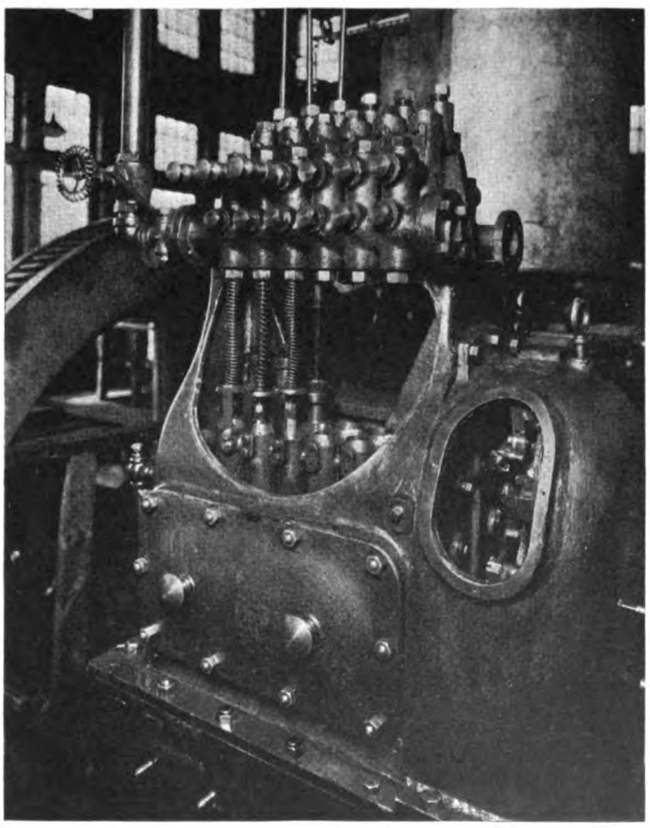


Fig. 5.—Fuel Pumps

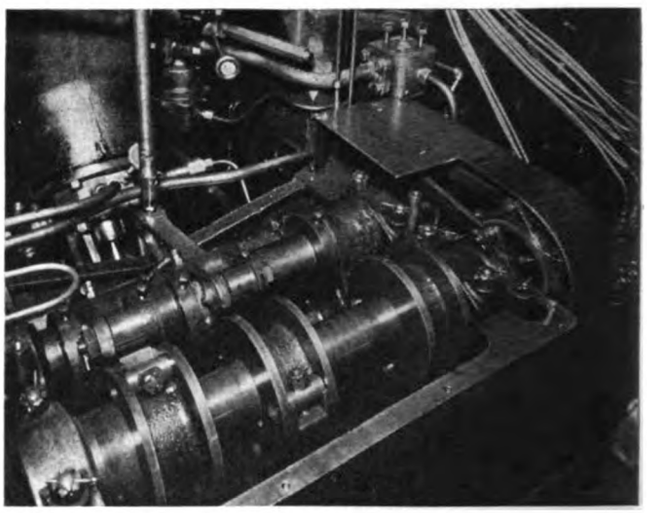


Fig. 6.—Camshaft

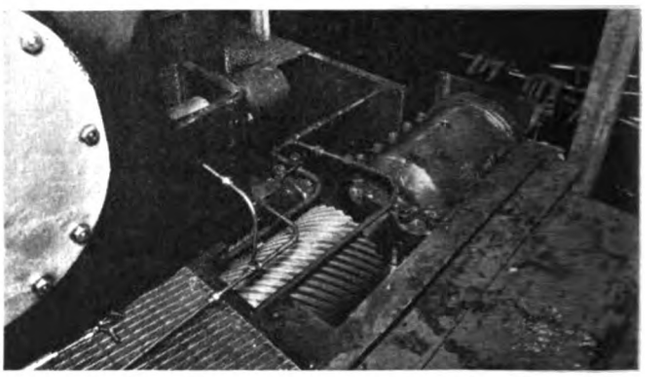


Fig. 7.—Reverse Gear

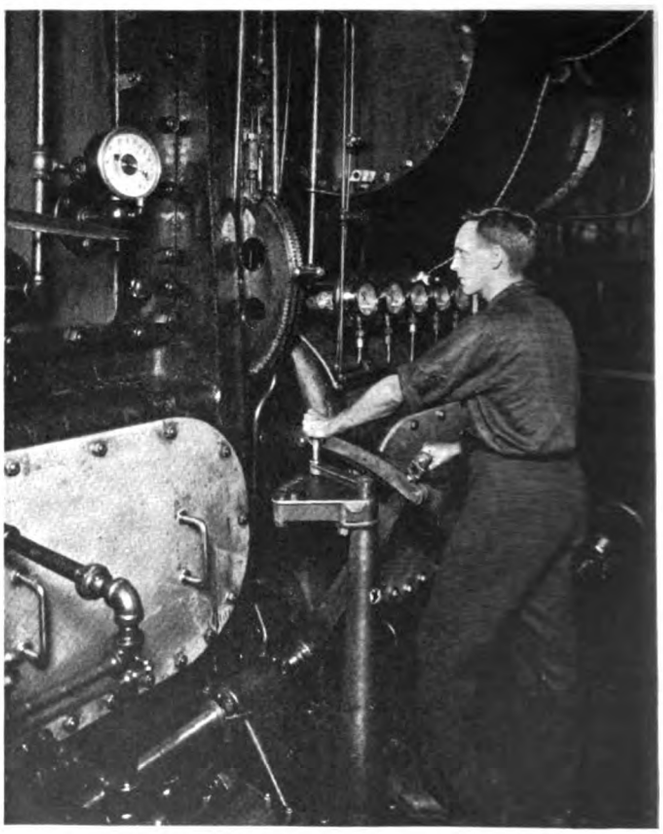


Fig. 8.—Control Station

Generated on 2024-09-12 12:26 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

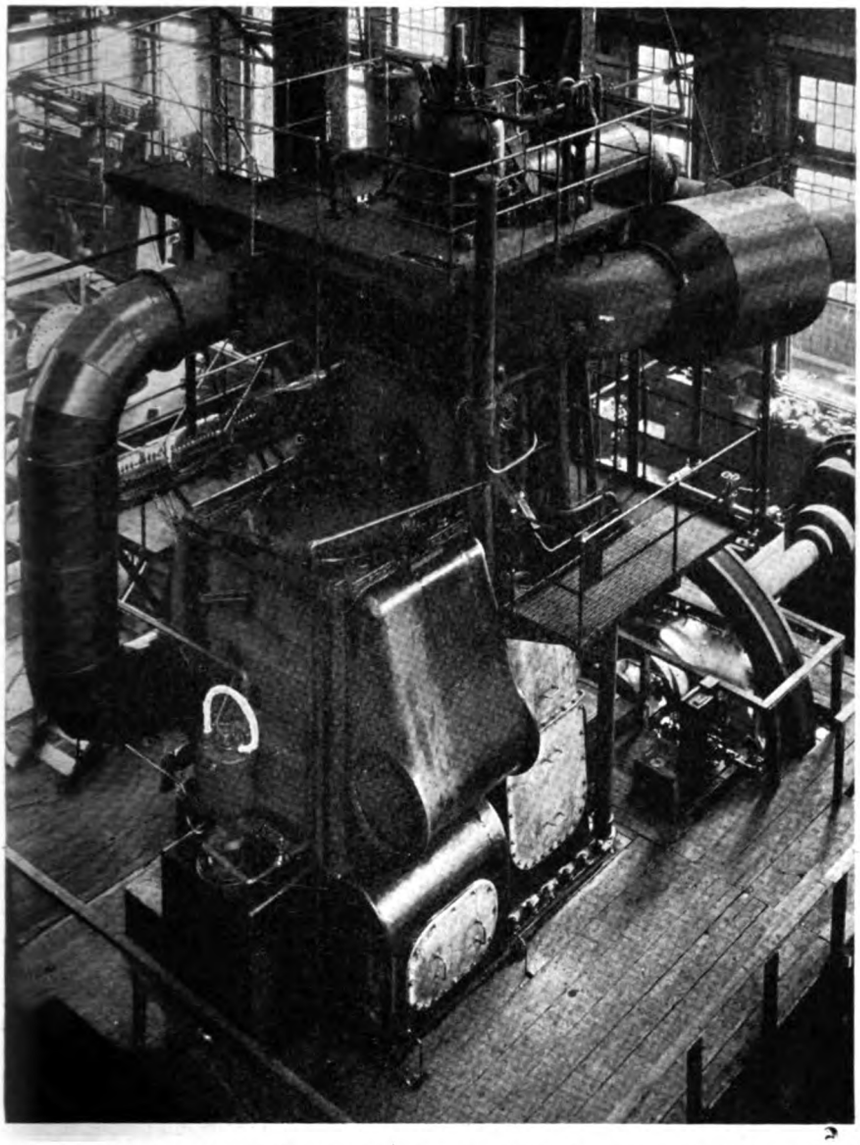


Fig. 9.—Single Cylinder Unit of Worthington Two Cycle Double Acting Diesel Engine Under Test in the Builders' Works at Buffalo

ing at the right, through the oval opening in the casing.

In the photograph of the cam shaft (Fig. 6) the lower front fuel valve appears at the upper left with the air starting connection at its right and slightly above it.

The reversing gear is shown in Fig. 7. Its operation is similar in principle to the countershaft valve gear formally fitted in high speed steam engines—notably by the Herreshoff Company in its torpedo boats and other high speed craft.

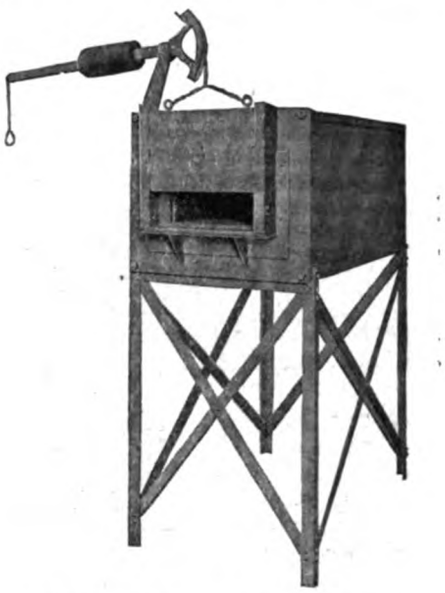
Fig. 9 gives a good general idea of the single cylinder experimental engine now in operation at the Buffalo plant of the Worthington Company. In this photograph, the scavenging pump appears at the right, in way of the cylinders, with the flywheel and shaft below.

Greater Detroit and Greater Buffalo Built by American Shipbuilding Company

In the description of the new side wheel steamer *Greater Detroit,* recently completed by the American Shipbuilding Company, Cleveland, O., for the Detroit & Cleveland Navigation Company, Detroit, Mich., which was published on page 527 of our September issue, it was erroneously stated that the *Greater Buffalo,* a sister ship, was launched by the Great Lakes Engineering Works. Both of these vessels were built by the American Ship Building Company.

Industrial Electric Furnace for Treating Metals

A NEW industrial hearth-type electric furnace for operation up to 1,850 degrees F. has been recently perfected by the Westinghouse Electric and Manufacturing Company, East Pittsburgh, Pa. These furnaces, which are known as type B, are made with hearth sizes ranging from 4 inches wide and 10¼ inches deep to 12 inches wide and 36 inches deep and are particularly well suited for such operations as annealing, hardening, tempering, normalizing, carbonizing, case hardening, vitreous enameling, and for laboratory work. Automatic temperature control makes it possible to duplicate heating conditions as often as is necessary and enables a predetermined manufacturing schedule to be carried out.



Westinghouse Electric Furnace

One of the distinctive features of this new furnace is that the muffle plates, which completely enclose the heating chamber, are perforated so that heat is radiated directly from the heating element to the charge. This unusual construction permits a higher temperature in the heating chamber without undue deterioration of the heating elements. These elements, which consist of S-bend coils of nickel-chromium wire, are placed on all four sides of the heating chamber and are supported and alined by molded studs on the muffle plates.

SUSPENSION OF DOOR

The door of the type B furnace is suspended by a chain from one point, which, being always on the circumference of an arc at the end of the operating handle, maintains a position directly over the center of the door when it is being opened or closed. This method of operation prevents the door from sticking or jamming in its guides. A superior point in the design of this new furnace is the arrangement of the insulation so that the muffle plates do not carry any of the weight. One of the many advantages of the electric furnace is its automatic control, enabling the operator to maintain a desired temperature indefinitely during any particular operation.

Generated on 2024-09-12 12:03 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

The Fathometer

THE submarine bell has, for a number of years, been recognized as a most valuable aid to navigation and during the late war detection of moving, power-driven vessels by acoustical methods was developed to a high degree of perfection.

In the course of certain of the experiments carried on in the process of developing these submarine ship detectors, it was found that certain sounds coming to the receiver, or microphone, had been reflected up from the bottom of the sea and had not come by a direct course from their source.

Fig. 1.—The Fathometer

The instrument by which the vibrator is set in motion and stopped, the return sound to the microphone received and the corresponding depth, as measured by the time interval between these two events, is indicated.

It was but a short step to the consideration of the relation of the time required for the reflected sound to reach its destination and the depth of water which had determined its course, and at once a field containing the greatest possibilities was opened up.

Early Sonic Sounding Experiments

The possibility of measuring depth of water by acoustical methods was not first discovered as a result of wartime activities. It had been realized for some time that here lay a fruitful field of investigation and a number of devices had been developed for this purpose, but, although some encouraging results had been obtained, much of the apparatus was of too delicate a nature and required too fine adjustment to permit of practical use on shipboard.

With the conclusion of wartime activities, attention was naturally turned to the question of applying some of the results obtained to more peaceful pursuits. In the navy, extensive experiments were carried out to develop the possibilities of the so-called "sonic" sounding, and one private concern, the Submarine Signal Corporation, of Boston, Mass., which had been active in the design and construction of various sound detecting devices during the war, turned its attention to the development of a commercial sonic sounding machine, based upon the experience gained from the early development of the art and its wartime experiments.

Principle Upon Which Fathometer Works

The principle upon which this apparatus works is quite simple. Sound is much more clearly and uniformly transmitted through the water than through the air. Its velocity through the former medium is in the neighborhood of 4,800 feet per second. Thus, if the time elapsed between the making of a sound, say, on a ship's bottom, and the moment of its return from the bottom of the ocean, by echo, to a receiver near its origin is accurately measured, it is evident that this period is in the same ratio to one second that twice the depth of water is to 4,800 feet. It is very evident that, while the principle is simple enough, the actual determination of the sound period with sufficient accuracy to be of material value is a most difficult matter, the difficulty increasing as the depth of water decreases.

In water of 40 fathoms depth, the time required for a sound to go from the surface to the bottom and be reflected back to the surface is approximately 1/10 of a second. It is evident that not only a most microscopic measure of time is essential, but that the sound must be practically instantaneous, if the depth is to be measured with any approach to accuracy.

In the "Fathometer," developed by the Submarine Signal Corporation, these two essential features have been realized.

Production of the Sound

First, as regards the production of the sound, this is accomplished by a vibrator, consisting of two rectangular steel plates, which can be easily incorporated as a section of the bilge keel, about 36 inches long and 9 inches wide set in a metal frame attached to the ship's bottom, and with a space of a fraction of an inch between them. In the demonstration set on the S. S. *Berkshire* the vibrator is inserted in the bilge keel. In the space between the two plates are inserted two magnetic coils, one actuated by direct and the other by alternating current. The latter produces vibrations in the plate at a rate of 1,050 per second, producing a high, sharp musical tone. The direct current coil keeps a constant tension in the plates, doing away, so to speak, with all "backlash," and also stopping vibration, the moment the alternating current ceases to act. The pressure of the water also acts as a further brake to superfluous vibration.

Returning to the ship, the sound is received by a microphone, placed in the bottom plating in such a manner that it can be easily removed and replaced without dry docking the vessel.

Construction of the Fathometer

It remains to describe the fathometer proper—the instrument by which the vibrator is set in motion and stopped, the return sound to the microphone received and the corresponding depth, as measured by the time interval between these two events, is indicated.

As shown by Fig. 1, there is on the front of the instrument a fixed circular glass disk, upon which are engraved two scales, the inner one for use in measuring depths up to 100 fathoms and the outer for greater depths. Back of the fixed face is a revolving disk, carrying an electric glow discharge tube opposite a slot in the face just outside of the inner scale.

Generated on 2024-09-12 12:25 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

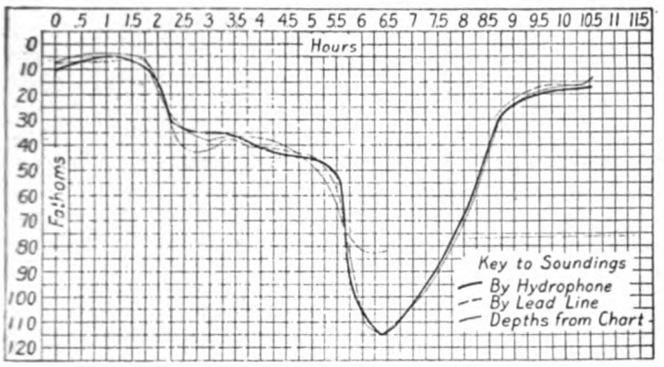


Fig. 2.—Comparative Sounding Data Made with a Navy Hydrophone on the U. S. S. Blakeley Cruising Off Montauk Point.

When the inner (shallow water) scale is in use, the movable disk rotates at a rate of 4 revolutions per second. As the glow tube passes the *O* of the scale, an electrical contact, lasting a small fraction of a second, is made which operates the vibrator. When the echo of the sound thus produced is received by the microphone, an electrical vibration is set up which, by means of relays, energizes the glow tube and a flash of light through the slot in the face indicates its position. The number on the scale at the point where this flash appears indicates the depth of water in fathoms.

Deep Water Soundings

For depths greater than 100 fathoms, the original sound and the echo are sufficiently separated to be easily detected by the ear and a different procedure is followed. By turning a switch, the revolution of the disk is reduced to a rate of one in 1½ seconds. At the same time, a constant rotating light appears in a slot outside of the outer (deep water) scale. As before, the vibrator operates each time the light passes *O*, but the return echo, instead of being indicated by a flash, is picked up by ear, through a telephone receiver, and the spot on the scale, where the constant light happens to be when the return "click" is heard, is noted by eye, and the corresponding draft read off.

The accuracy of the instrument depends upon a uniform rotation of the disk, a uniform rate of sound transmission through the water, and the ability to distinguish the echo from ship noises and other extraneous sounds. The first is very satisfactorily controlled electrically, and the maximum error reduced to a fraction of a percent. The second possible error arises from the variation in the conductivity of sea water due to changes in temperature, pressure and salinity. While these have an effect, the resulting error apparently amounts to less than one fathom in depths of 500 fathoms or over, and for all practical purposes can be neglected. Regarding the third item, a system similar to tuning in a wireless receiver is followed. Practically all sounds but the echo are filtered out, and there is no difficulty in picking it up.

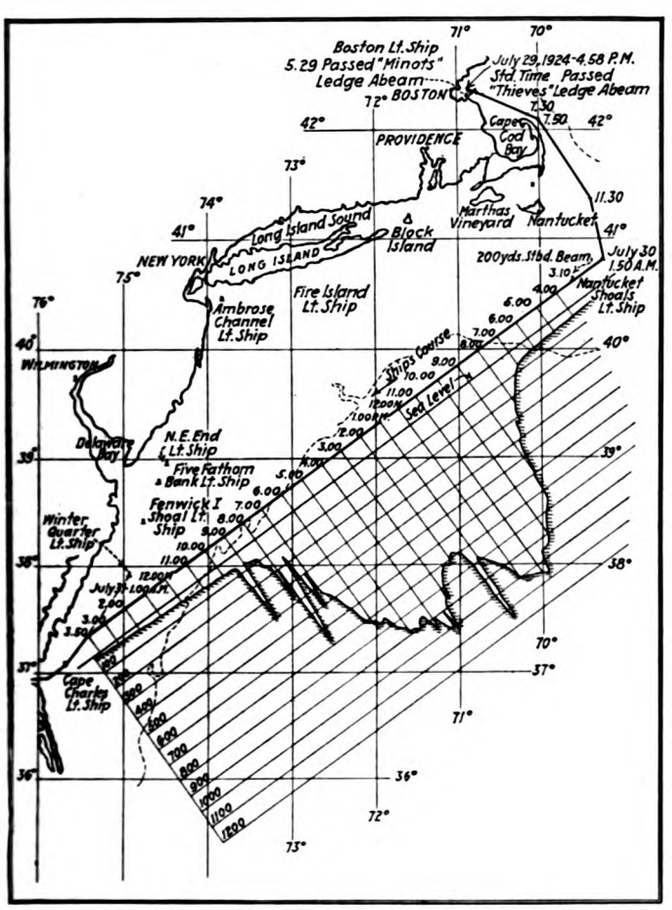


Fig. 3.—Fathometer Chart Made During Trip of S. S. Berkshire July 29 to August 1, 1924

Accuracy of the Instrument

The results obtained by the fathometer have the appearance of being, for all practical purposes, as accurate as those of ordinary mechanical soundings. In a recent run of the *Berkshire* the writer had the opportunity of comparing depths obtained by the fathometer with those shown on the chart, and found them in virtually absolute agreement. For an absolute check, it would be necessary to know the actual position of the ship, but by taking successive readings it was possible to determine this very closely, and the correspondence of the observed depths with those on the chart was most remarkable.

As an indication of the possibilities and accuracy of sonic sounding, the two accompanying diagrams are of interest, both being continuous records, taken from ships under way. Fig. 2 shows soundings made by the U. S. S. *Blakeley*, off Montauk Point, using a navy hydrophone, while Fig. 3 is a record of soundings made by the fathometer on the S. S. *Berkshire* on a voyage from Boston to Norfolk.

Accelerated Circulation Features New Marine Boiler

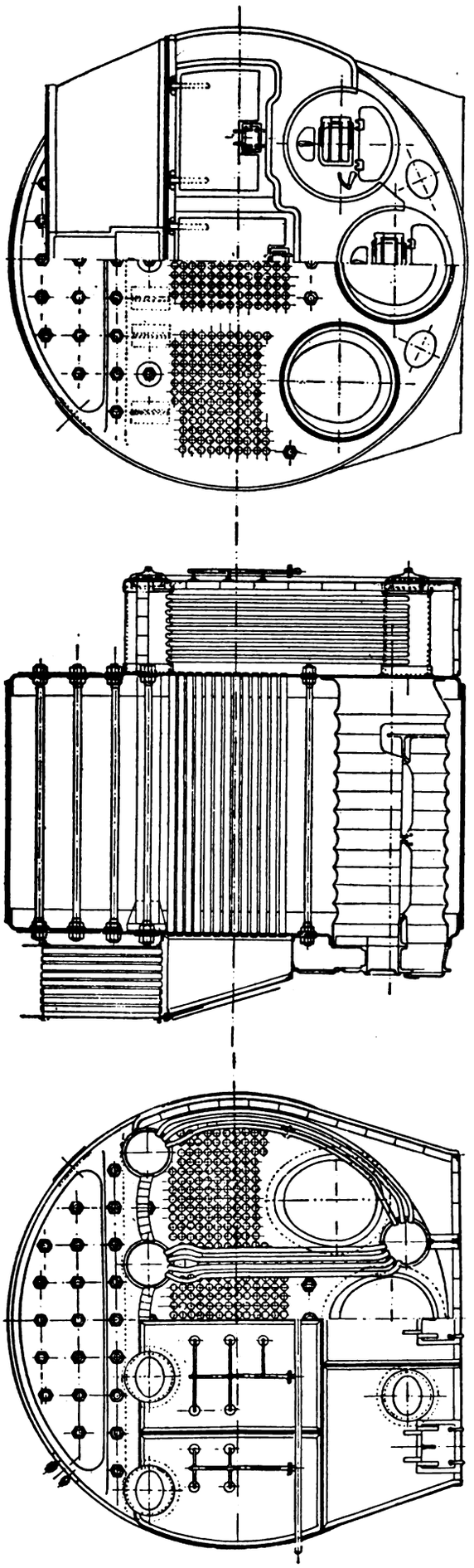
THE Prudhon-Capus marine type boiler, the license for which is controlled by the Chantiers Navals et Chaudronneries du Midi, has been recently brought to a stage of development that has warranted a number of major French steamship lines to adopt it on several new vessels.

Although the Prudhon-Capus boiler has been designed along lines similar to those of the ordinary Scotch marine boiler, certain features have been incorporated for which advantages are claimed over the conventional type. The principal features of the design are brought out in the accompanying drawings.*

In its essential features, the Prudhon-Capus boiler consists of a cylindrical envelope having a front and back end with the smoke tubes, side tubes and furnaces passing through the cylinder. Two groups of collectors of large diameter are installed at the back end of the boiler. These collectors are in free communication with the inner space of the main cylinder, one group being fitted at the lower part of the boiler and the other at the upper part. The normal

* Publication of these drawings has been possible through the courtesy of the *Marine Engineer and Naval Architect*.

Generated on 2024-09-12 12:14 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN



Cross Sections and Sectional Elevation of Prudhon-Capus Boiler

water level passes directly through the center of each upper collectors. The upper and lower groups of col are connected by means of tube nests fitted inside a combustion chamber which is surrounded by walls m firebrick strongly attached to the exterior of the metal casing.

Groups of Tubes in Combustion Chamber Cause Rapid Circulation

It is quite evident that the groups of tubes situated at the lower part of the boiler where the gas temperature is highest constitute a direct heating surface of comparatively high efficiency. Because of this, a rapid circulation of water takes place as soon as the fire is lighted in the furnace and, it is claimed, that the maximum boiler pressure may be reached in a much shorter time than is the case in the ordinary type of boiler. In addition, the large volume of the combustion chamber assures a good mixing of the gases and so enables a forced draft system to be employed economically.

In order to make each combustion chamber independent in this design it is only necessary to insert a division wall of firebrick between the immediate sets of tubes. Ashes which may be carried over from the furnace are collected at the lower part of each combustion chamber where a cleaning door is fitted. Each door is arranged so that the ashes may be removed while the boiler is working. The smoke and watertubes can be cleaned by means of a steam jet in the usual way.

Prudhon-Capus Boiler Highly Efficient

The watertubes installed in the boiler which set up a rapid circulation are credited with producing the high efficiency of the Prudhon-Capus boiler as compared with the customary cylindrical boiler. Even at high speeds there are no visible signs of smoke which indicates efficient combustion at all times. Because the interior combustion chambers have been eliminated in this boiler, the great number of stays ordinarily required in the installation of combustion chambers is eliminated. All parts of the Prudhon-Capus boiler are readily accessible and no part of the boiler is liable to damage from low water.

Manholes are provided at the head of the collectors to insure satisfactory ventilation when the boiler is empty and to make inspection of the tubes and their cleaning easy. Another feature is that the intense circulation of water in the tubes prevents the formation of deposits, while the differences of expansion and contraction which cause wear in certain parts of the usual type boiler are also eliminated.

Advantages Claimed for the Boiler

The most important of the advantages claimed for the new type marine boiler is the elimination of the combustion chambers, as this provides greater facility for repair work. Renewal of the tubes on a ship can be performed in successive stages, thus avoiding considerable delay of a vessel in port. Another special feature of the boiler is the possibility of removing ashes while the boiler is still in service. Ordinarily the accumulation of ash in combustion chamber boilers would have to be removed when the boiler was cold.

An idea of the size of a typical ship installation may be gained from the boilers to be fitted on four new passenger vessels of the Services Contractuels des Messageries Maritimes.

These boilers will be about 17.5 feet in diameter by about 12.5 feet in length, the distance between tube plates being about 8.2 feet. Each of the four furnaces will have an external diameter of about 4.06 feet, and an internal diameter of about 3.74 feet. The total heating surface will be about 3,845 square feet. The total weight of the empty boiler is to be 63.5 tons and that of the water, 28.5 tons. The boilers are to be fitted with Howdens forced draft system and will use oil as fuel.

Generated on 2024-09-12 12:02 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

The Action of the Contrapropeller*

Principle Upon Which the Contrapropeller Acts—Wagner and Hass Types—Method of Calculation—Results with S.S. Norfolk

By Olav Overgaard†

IMPROVING the efficiency of the screw propeller, or regaining some of the inherent energy losses, is an old dream, a dream which has been the chief incentive towards developing and compiling the valuable research material forming the present basis of naval architecture. The screw propeller itself has reached a state of development where its most efficient form of design and the various essential factors upon which its maximum efficiency depends have been determined. We, therefore, can hardly expect any appreciable increase in propeller efficiency.

Thornycroft was probably the first to conceive the idea of using guiding vanes abaft a screw propeller. His apparatus, called the screw turbine, and the result of his experiments will be found in the *Transactions of the Institution of Naval Architects* 1883 to 1885. Had the present knowledge of hydro-dynamics and the results of model propeller experiments been at Mr. Thornycroft's disposal, there is no doubt but that he, with his apparatus, would have obtained a greater efficiency than that attained by the screw propeller alone. As it was, he managed to prove that it is possible to change the rotary motion in the propeller discharge into straight rearward motion, thereby obtaining a forward reaction or thrust.

The Contrapropeller

The first practical guiding apparatus, effecting a considerable increase in the efficiency of ship propulsion, owes its existence to Dr. Rudolf Wagner. His apparatus was tried officially for the first time in 1912 on a torpedo boat of 17,000 indicated horsepower and 28 knots with a result of 12 percent decrease in engine horsepower, maintaining the same speed. Developing this same engine horsepower, the vessel obtained an increase in speed of about 1 knot.

A Norwegian concern, the Star Contrapropeller, Ltd., secured Wagner's invention in 1920, naming his guiding apparatus the "contrapropeller."

Due to this concern's tireless efforts and comprehensive research work, the contrapropeller today is fully developed and its favorable influence upon ship propulsion as well as steering ability a recognized fact.

The principle upon which the contrapropeller acts is similar to the idea evolved by Thornycroft. The rotary motion, imparted to the water by a revolving screw propeller, is, by means of guiding vanes placed abaft, changed into a straight rearward motion, the angle of the guide blades being

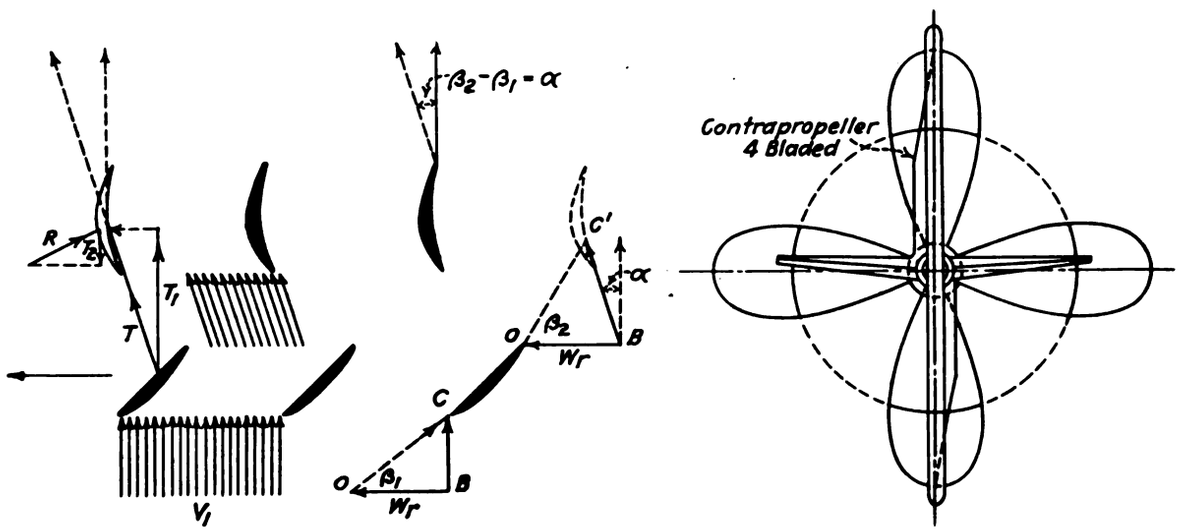


Fig. 1

so related to the generatrix-like stream lines from the propeller that a forward reaction or useful thrust is realized.

If we imagine a section cut out of each blade of a screw propeller and contrapropeller respectively at the same radius, and these sections arranged in consecutive order, as shown in Fig. 1, we have an approximate idea of the action of the contrapropeller upon the propeller discharge.

In order to make it easier to understand the conception involved in the following we will assume that:

(1) There are no losses due to friction.
(2) No change from velocity to pressure energy or vice versa takes place.
(3) The water enters the propeller with an absolute velocity the same as that of the ship.

From the diagram of velocities (right) it will be seen that the water enters the screw propeller in axial direction at a velocity V_1, but the tangential velocity imparted by the rotating screw propeller deflects the direction of the flow, α being the angle of deflection.

We have $O\,C$ = the resultant velocity of the propeller's tangential velocity W_r and axial velocity V_1.

It follows that the water discharged from the screw propeller must enter the contrapropeller at an angle of deflection and an absolute velocity $O\,C$.

Owing to the angle of the contrapropeller blades, however,

*This article is supplementary to the one by Dr. Ernst Foerster on "Propeller Guiding Devices" in the September, 1924, issue of Marine Engineering and Shipping Age.

†Marine Department, Th. Goldschmidt Corporation, 15 William St., New York.

Generated on 2024-09-12 12:03 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

with respect to that of the propeller discharge, the latter is again changed this time into direct rearward direction, i. e., the contrapropeller blades deflect the water in the opposite direction, β_2—β_1 being in this case the theoretical angle of deflection.

Applying the foregoing to the diagrams of forces (left) we get:

T the reaction upon the screw propeller or the resultant of tangential and axial forces; of these two, the latter, T_1 only produces forward useful thrust.

The force caused by the rotating water masses in bounding against the contrapropeller blades and changing direction produces a forward reaction, the axial component of which T_2 represents useful thrust regained.

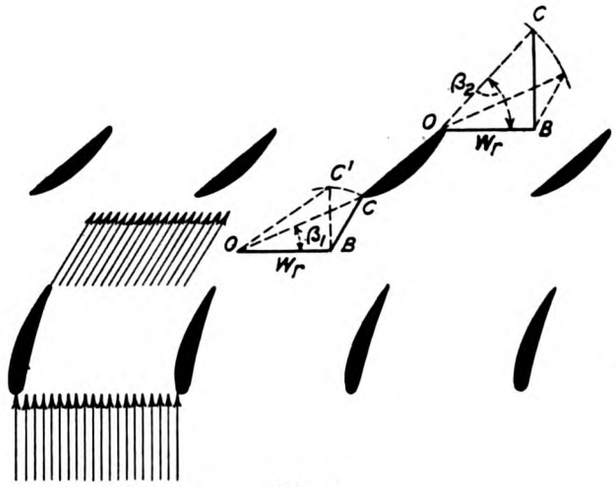


Fig. 2

We get:

$T_1 + T_2 + T_3 = T$ = Total theoretical thrust.

Where T_3 represents the thrust effected by the suction which the propeller exerts on the water flowing aft.

In Dr. Foerster's article on page 531 of the September issue of Marine Engineering and Shipping Age will be seen 6-bladed and 4-bladed types of contrapropellers respectively in Figs. 1, 2 and 3. Of these the 6-bladed type is the one originally developed. Later model tank experiments, however, having shown that the efficiency of a 4-bladed propeller is only slightly below that of a 6-bladed one—about 1 percent—the former has been adopted on account of its simplicity and less obstructional nature with respect to floating objects. In this connection it should be mentioned that contrapropellers of this type are usually tested with the propeller "open."

Contrapropeller Forward of the Screw Propeller

The idea of reversing the principle described in the foregoing and thereby obtaining a similar result belongs to Professor Hans Hass. Dr. Schaffran, who investigated the Hass guiding apparatus at the experimental tank in Berlin, observed an improvement in propulsive efficiency of 15 percent due to this guiding apparatus; the test being made with the model of a tug boat with Hass guiding apparatus and model screw propeller "behind." After its efficiency had been established by model and dynamometer tests, the latter with a tugboat fitted with four guiding vanes, Professor Hass' invention was also taken over by the Star Contrapropeller Corporation in 1923.

In order to distinguish between the two, the Wagner guiding apparatus is now called contrapropeller type I, and the Hass, contrapropeller type II.

Fig. 2 is the reverse of Fig. 1 and makes more explicit the changes involved when reversing the principle. Neglecting friction and drag of ship as in the foregoing, we have:

The water entering the contrapropeller at an axial velocity V_1 is deflected through an angle α, due to the inclination of the guiding vanes, thus receiving a direction of rotation opposite to that of the screw propeller. The transverse force, however, exerted by the screw propeller tends to divert the flow of the water into a rearward direction.

Referring to Fig. 2, $O\,C'$ is obviously the resultant of the tangential velocity W_r and relative entrance velocity V_1, and is the rearward velocity at which the water is discharged from the screw propeller.

From the velocity diagrams it will be seen that the deflection caused by the propeller, when discharging the water in axial direction, is β_2—β_1. It is obvious that the total reaction in this case is axial and therefore is the additional useful thrust received by the screw propeller.

An increase in thrust, however, reduces the number of revolutions, a fact which must be taken into consideration when designing a contrapropeller type II.

Owing to the turbulent state of the water forward of the screw propeller, it is difficult, when designing contrapropellers type II, to arrive at the correct blade angle by calculation, especially does this refer to slow freighters having full lines aft. At high speed and fair lines the calculations compare favorably with actual results. It has, therefore, been customary to subject models of ships, to be fitted with such guiding devices, to a tank test with the propeller "behind."

The same method of calculation and the same formulæ apply to both types of contrapropellers. Type I, however, seems to conform more closely with the mathematics involved, and the maximum blade angle derived usually lies between 30 and 36 degrees. A series of model tests with type II, together with results obtained by ships in operation, has also made it possible to predict in advance an efficient blade angle with a fair degree of accuracy. For ordinary freighters this angle varies between 15 and 18 degrees.

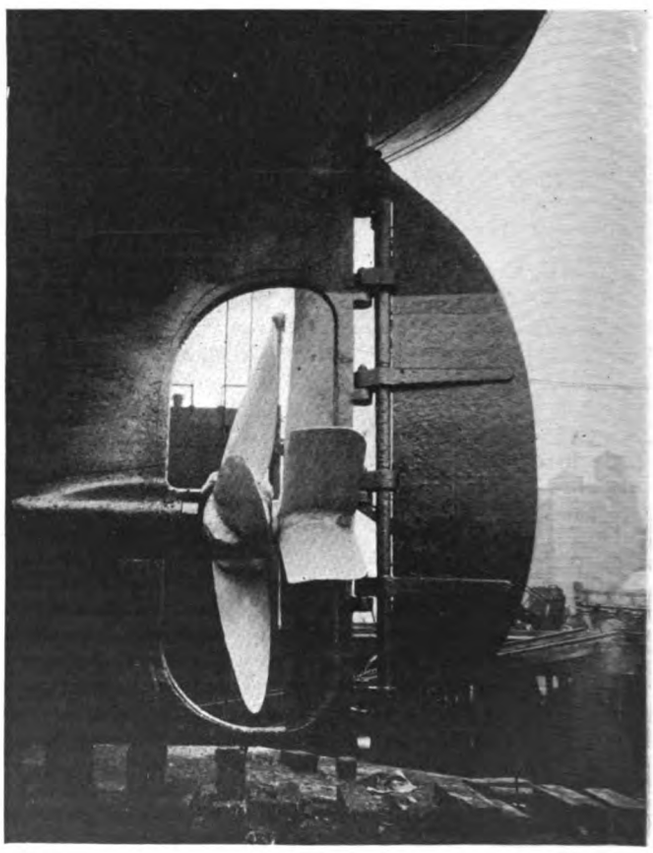


Fig. 3.—Contrapropeller Installed on S. S. "Norfolk"

Generated on 2024-09-12 12:01 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

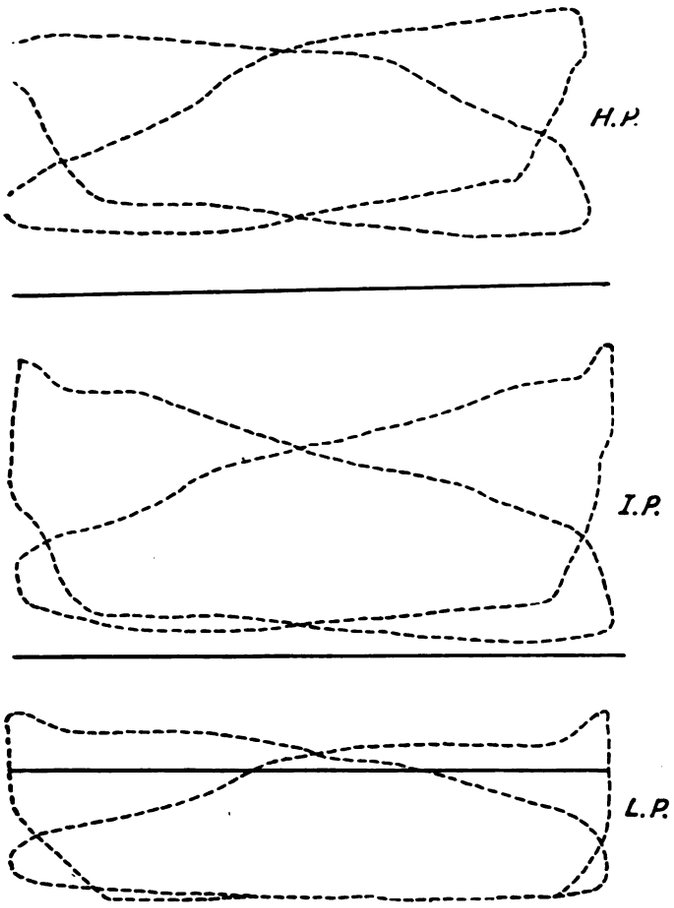


Fig. 4.—Indicator Cards Taken Before Fitting the Contrapropeller on the "Norfolk"

Horsepower: high pressure, 464; intermediate pressure, 580; low pressure, 515; total, 1,559. Expansions: ½ open, ¼ open, ¾ open. Boiler pressure, 180 pounds per square inch; revolutions per minute, 73; speed, 9.4 knots. Coal consumption, per 24 hours, 34 tons.

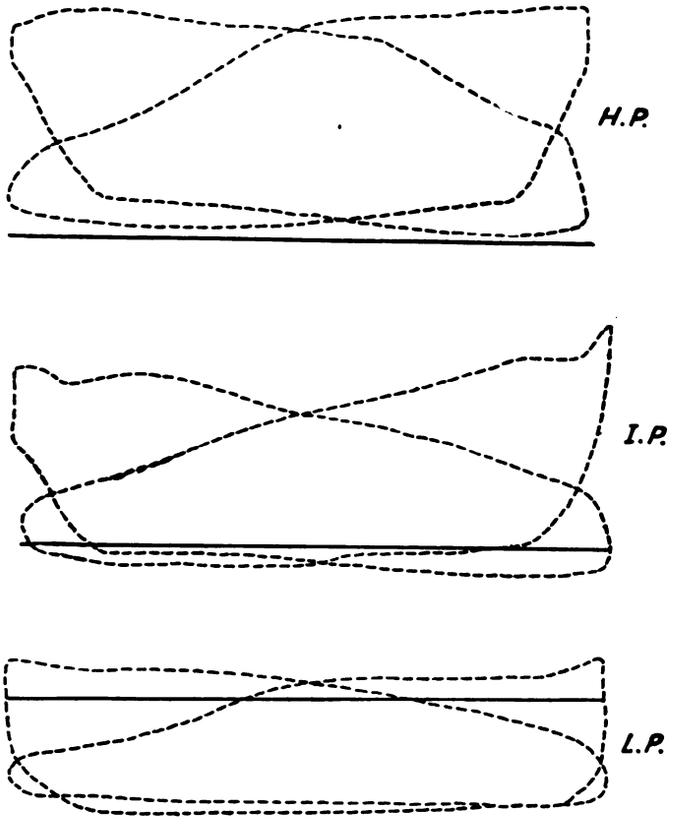


Fig. 5.—Indicator Cards Taken After Fitting the Contrapropeller on the "Norfolk"

Horsepower: high pressure, 582; intermediate pressure, 472; low pressure, 424; total, 1,478 Expansions: high pressure, 3¼ inches; intermediate pressure, 2 inches; low pressure, 2 inches shut in. Boiler pressure, 180 pounds per square inch; revolutions per minute, 70; speed, 9.82 knots. Coal consumption, per 24 hours, 28 tons.

Figs. 4 and 5 in Foerster's article (see page 532 of the September issue) show a contrapropeller type II for single screw ships. Here the vertical guide vane, utilizes the transverse motion of the water flowing in behind the ship. A fair result has, therefore, been obtained with one vertical blade only. This type of contrapropeller is especially suited for ships having a balanced rudder and would be ideal for vessels of the "lake type."

Fig. 7 (see page 533 of the September issue) indicates a contrapropeller of types I and II combined on a twin screw ship. This combination has not as yet been tested on a comprehensive scale. We may assume, however, that its influence upon the stream line action of the water closing in around the ship will be more beneficial than guide vanes forward only.

Calculation of the Contrapropeller

The screw propeller is first analyzed in order to determine its theoretical efficiency and the factors upon which the design is based. Taylor's method and $\rho.\delta.$ diagrams are used for this purpose (see Taylor's paper in the *Transactions of the Society of Naval Architects and Marine Engineers,* 1923).

By determining the velocities and diameters of the water column forward and aft of the screw propeller and contrapropeller respectively, the angle of deflection a and the amount of water discharged per second may be found.

We now have sufficient data for obtaining the moment of momentum and, thereby, the absolute tangential velocity imparted to the water. Having this, the angular inclination of the guide vane may be found. This inclination, however, must be "exaggerated" according to the turbine theory. Dr. Blausius's diagram and formulæ are used for this purpose and give a fair degree of accuracy.

Contrapropeller research work has been carried out on a large scale at European model tanks and future experiments are expected to clear up uncertainties as to stream lines and the most efficient position of guide vanes with respect to them.

In the following paragraphs is given a report by Charles Skentelbery, marine superintendent of the Coastwise Transportation Corporation, 160 State Street, Boston, Mass., showing the performance of the S. S. *Norfolk* and comparing its efficiency with and without a contrapropeller:

Report of Performance of S. S. Norfolk, Comparing Efficiency With and Without Contrapropeller

The S. S. *Norfolk,* owned by the Coastwise Transportation Corporation, Boston, is the first American ship to be outfitted with a contrapropeller. After the installation on May 2, 1924, she resumed her voyages in the coastwise coal carrying trade, and we have since watched the performance of the vessel very closely, in order to ascertain the saving and improvements due to the contrapropeller.

The *Norfolk* is a single screw coal-burning vessel, built in 1913 by the New York Shipbuilding Corporation. Her dimensions and particulars are as follows:

Length between perpendiculars	310.7 feet
Beam molded	48.1 feet
Depth molded	25.5 feet
Gross tonnage	3,522 tons
Deadweight capacity	5,800 tons
Draft, loaded	24 feet
Indicated horsepower, normal	1,000
Average revolutions per minute, loaded	68½
Average revolutions per minute, ballast	70
Fuel consumption per 24 hours	33 tons
Average speed, loaded	8.9 knots
Average speed, in ballast	10 knots

Generated on 2024-09-12 12:04 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

The propelling machinery consists of one triple expansion surface condensing engine, and two single-ended Scotch marine boilers, having a working pressure of 180 pounds per square inch.

From the data listed above, it will be seen that the fuel consumption is 1.72 pounds per indicated horsepower per hour; aside from this, the *Norfolk* was a very poor steering vessel. To maintain a true course at sea was almost impossible, and with the engine stopped, the vessel simply ceased answering her helm. This, of course, was a source of considerable inconvenience when entering and leaving port.

After the contrapropeller had been installed, the first four voyages, 70 to 73 inclusive (see the following table), were made, with the machinery in the same condition as before, for the purpose of testing and comparing the direct influence of the contrapropeller.

The result was:

Speed 8.75 knots, loaded, or an increase of 0.85 knot or 9.5 percent.

Speed 10.95 knots, light, or an increase of 0.95 knot.

Fuel consumption 28 tons, or a decrease of 5 tons or 15.5 percent.

Assuming that the indicated horsepower varies approximately as the cube of the speed, it follows that the horsepower would have had to be increased about 27 percent to obtain the increase in speed stated above.

The contrapropeller produced a remarkable improvement of the steering ability. The master reports that the *Norfolk* now steers excellently, she maintains a true course at sea with very little rudder, is easy to maneuver, and keeps her steering way for a long distance with the engine stopped. Previous to the installation of the contrapropeller, the feed water heater had always depended upon the steering engine for a great deal of its exhaust. Owing to the radical improvement of the steering ability, however, it was found that the exhaust from the other auxiliaries was not sufficient to maintain the proper feed water temperature and live steam had to be added.

It was also found that with a strong head wind and heavy sea the *Norfolk* held her course steadily and maintained her speed, and there was a noticeable absence of propeller vibration.

We are very pleased with the results obtained on S. S. *Norfolk* as the fitting of this vessel with a contrapropeller has considerably reduced her operating cost and increased her efficiency.

[Signed] CHAS. SKENTELBERY, marine superintendent, Coastwise Transportation Corporation.

Comparing the indicator diagram data taken on voyage No. 63, when the *Norfolk* was running without the contrapropeller, with the report from voyage No. 78 (the latest on record) we see that the contrapropeller has effected the following saving:

An increase in speed of 1.1 knots.

A decrease in fuel consumption of 6 tons (5 tons compared with the average).

A decrease in power of 52 indicated horsepower.

The above results are unusually favorable, and although they must not all be attributed to the addition of the contrapropeller, it must be borne in mind that they include two distinct advantages, i. e., improvement of the steering ability and propulsive energy gained.

Assuming that about 3 percent of the decrease in fuel consumption and 4 percent of the increase in speed are due to improved steering ability, furthermore, that minor engine repairs possibly are responsible for 2 percent, there still remains 25 percent to be considered as direct energy gain.

These figures are not merely assumed but are based partly on steering diagrams and the average steam consumption of the steering engine.

BEFORE FITTING CONTRAPROPELLER

Voyage No. 63. From Newport News to Boston, February 14, 1924.

Loaded ship.

Engines, 23⅜ inches by 38½ inches by 64 inches by 45 inches stroke.

Boiler pressure, pounds per square inch, 180.

Receiver pressure, pounds per square inch, high pressure 175, intermediate pressure 50, low pressure 9.

Vacuum, inches, 25.

Revolutions per minute, 73.

Expansions: ½ open, ¾ open, ¾ open.

Throttle: full open.

Temperatures: Hotwell, 120 degrees F.
Sea, 36 degrees F.
Feed, 190 degrees F.
Discharge, 106 degrees F.

Speed by Log in knots, 9.4.

Indicated horsepower:

High pressure	464
Intermediate pressure	580
Low pressure	515
Total	1,559

Fuel consumption, per 24 hours, 34 tons.

WITH CONTRAPROPELLER

Voyage No. 78. From Newport News to Lynn, Mass., August 16, 1924.

Loaded ship.

Engines, 23⅜ inches by 38½ inches by 64 inches by 45 inches stroke.

Boiler pressure, pounds per square inch, 175.

Receiver pressure, pounds per square inch, high pressure 175, intermediate pressure 40, low pressure 3.

Vacuum, inches, 25.

Revolutions per minute, 73.

Expansions: High pressure, 3½ inches; intermediate pressure, 2 inches; low pressure, 3 inches.

Throttle: Full open.

Temperatures: Hotwell, 138 degrees F.
Sea, 20 degrees F.
Feed, 200 degrees F.
Discharge, 125 degrees F.

Speed by Log in knots, 10.5.

Indicated horsepower:

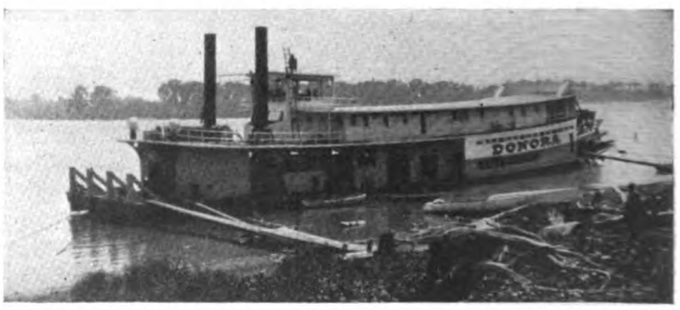
High pressure	551
Intermediate pressure	476
Low pressure	486
Total	1,507

Fuel consumption, per 24 hours, 28 tons.

LOG OF S. S. NORFOLK

Voyage No.	Voyage	Distance in Knots	Hours, Full Speed Steam	Average Speed, in Ballast	Average Speed, Loaded	Remarks
69	New York to Norfolk.	278	27.8	10.0	....	Fine weather.
	Norfolk to New Bedford	388	45.1	....	8.6	Moderate head sea.
*70	New Bedford to Baltimore	508	46.0	11.0	....	24 hours rough head sea.
	Baltimore to Bangor, Me.	770	75.5	....	10.2	Moderate weather.
*71	Bangor, Me., to Norfolk	638	60.3	10.5	....	Fine weather.
	Norfolk to Boston....	517	51.4	....	10.1	Fine weather.
*72	Boston to Newport News	547	54.1	10.1	....	Fine weather.
	Newport News to Boston	516	56.1	....	9.2	Foggy weather.
*73	Boston to Norfolk....	508	45.7	11.1	....	Fine weather.
	Norfolk to Providence	371	37.7	....	9.8	Fine weather.
74	Providence to Newport News	373	38.6	9.6	....	Rough head sea.
	Newport News to Providence	379	41.0	....	9.2	Fine weather.
75	Providence to Norfolk	373	36.8	10.7	....	Fine weather.
	Norfolk to Portsmouth, N. H.	579	62.6	....	9.3	Fine weather.
76	Portsmouth to Norfolk	546	50.3	10.8	....	Fine weather.
	Norfolk to Providence	370	39.5	....	9.36	Fine weather.
77	Providence to Newport News	371	34.7	10.69	....	Fine weather.
	Newport News to Boston	511	54.2	....	9.3	Fine weather.
Nine voyages		8,543 Knots	857.4 Hours	10.43 Average	9.45 Average	

*Voyages with machinery maintained in the same condition as before.



Stern Wheel River Towboat Donora

Built by Howard Shipyard, Jeffersonville, Ind., for American Steel & Wire Company. Length overall, 165 feet; beam, 32 feet; depth, 6 feet 3 inches. Equipped with 4 boilers 40 inches diameter by 28 feet long and 2 tandem compound condensing engines 14 and 28 inches diameter by 84 inches stroke.

Generated on 2024-09-12 12:05 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

The Flash Point of Fuel Oil

Résumé of U. S. Navy's Investigations

IN seeking data concerning the proper flash point for fuel oils stored on board vessels, certain investigations made by the U. S. Navy in 1913 and early 1914 were consulted. It was found that the Navy had with great thoroughness examined into the question of the minimum flash point, and the Navy Board's report contains so much interesting information on this subject, that it was felt that it would be of considerable interest and benefit to the marine world in general. To this end the following notes of the report, representing its salient and most interesting features, have been made:

"The flash point of petroleum is that temperature at which inflammable gases begin to be given off from the oil in sufficient quantities to form an explosive mixture with the air present. At this temperature, should a flame or an electric spark be applied close to the surface of the oil, a flash or blue flicker of flame will occur; however, the volume of gas will not be sufficient to make the flash continuous. At about 30 degrees Fahrenheit above the flash point the streams of rising gases are sufficient to cause general ignition of the gases, or a continuous flame (fire) or explosion.

"It was found that the Admiralties have prescribed the following minimum flash-points:

"United States	150 degrees F.
"Great Britain	175 degrees F.
"Germany	187 degrees F.
"France	200 degrees F.
"Russia	212 degrees F.
"Italy	212 degrees F.
"Austria	248 degrees F."

and further "that Lloyd's, the Dutch Government, and the German Government, together with local authorities, such as the Suez Canal and the Harbor Authorities at Hong Kong, prescribe 150 degrees F. flash as the minimum above which no special or extra precautions are required in ship construction, particularly with reference to the arrangement of cofferdams between bunker and boiler space, and bunker and cargo space. . . . . In merchant ship practice it has been, and is, usual for vessels to burn crude oils which flash at ordinary temperatures—75 degrees F. and above."

Data from the British Admiralty

The British Admiralty furnished the following information on flash points:

"Vapor is not evolved from oil fuel in such quantity as to be capable of ignition at a temperature more than 2 degrees F. below its flash point as obtained by close test. . . . Inflammable vapor is always present when the oil is at a temperature near the flash point. . . .

"A few exceptions to the above occurred, but only with mixed oils in which one ingredient has a very low flash point, as with a mixture of Texas and petrol. In those cases flashing took place 5 to 6 degrees below the flash point when fired by the electric spark.

"With oil in a covered tank, to represent oil storage compartments, but having only one vent pipe, no flash occurs on applying flame to the vent outlet when the oil is at a temperature much above its flash point. No flash was obtained within the range of temperature tried which in some cases reached 120 degrees above. When two vent pipes (one short and one long) were tried flashing took place at a minimum oil temperature of 8 degrees above with oil of 152 degrees F. P. and 14 degrees above with oil of 234 degrees F. P.

"With a partially closed chamber, to represent conditions that might obtain with bilges under boilers, flashing occurred at a minimum of 6 degrees above the flash point of the inclosed oil.

"With a completely uncovered chamber containing oil, and flame brought momentarily into contact with the surface of the oil, flashing of the vapor took place at a minimum temperature of 7 degrees above the flash point of the oil, and generally the oil became ignited at the same time. The results for different kinds of oil were, however, of a variable character, the vapor flashing from 7 to 78 degrees above the flash point.

"When wire gauze or suitable pierced metal sheet is placed over the outlet for the escape of vapor, it prevents any flame at the outlet from being carried into the oil chamber and causing an explosion there."

Assumptions

Prior to determining a line of procedure the Board determined upon three assumptions as the basis of their work, as follows:

"(a) That oils having viscosities such that they must be heated, in the bunkers, must have such a flash point that no explosive or inflammable mixtures are formed therein.

"(b) That it is undesirable and dangerous that oil should be heated anywhere—in bunkers or in firerooms—above the point where explosives or inflammable gases are given off.

"(c) That the reliability of flash cup in determining the point at which this condition of explosive mixture begins to exist should be checked in order that a guide may be established which may be known to be safe and positive."

Outline of the Navy Board's Work

With these assumptions established the following outline of the Board's work was laid down:

"(1) Procure a number of samples of oils representative of the production of all the oil fields of the United States and of Mexico. These oils include the entire range of oils.

"(2) To find the temperatures to which various oils must each be heated in the bunkers in order that the pumps may take a more than sufficient quantity for full speed steaming conditions.

"(3) To sample and analyze, and attempt to ignite, the gases given off in the bunkers at these temperatures, in order to ascertain the danger of such heating of oil in the bunkers.

"(4) To conduct an actual test of each kind of oil, using a type of naval boiler, Navy standard burner, etc., and ascertain the temperature to which each various type of oil must be heated at the burner in order to secure smokeless combustion.

"(5) To compare the flash point obtained with the Abdel or Pensky-Martins' closed flash cup with results obtained in a large tank representing a ship's bunker. This tank to be capable of being rolled and the oil agitated, which condition is known to have an effect on the formation and rate of formation of gaseous products."

The following oils were received by the Board for investigative test:

Origin	Gravity	Flash Point
Lima (Ohio)	30.4	149
Indiana	29.6	144
Illinois	27.2	146
Oklahoma (navy contract)	29.3	170
Louisiana, coastal	19.8	275
California, "star" gas oil	23.9	180
California, Richmond distillate	17.1	228
California, Avon distillate	17.1	168
California, Gaviota distillate	17.1	230
California, Oleum distillate	18.5	223
California, Coalinga crude	16.5	186
California, Producers' crude	16.1	174
California, Union Oil Company's Crude No. 18	12.9	285
California, Union Oil Company's Crude No. 25	12.9	280
California, Union Oil Company's Crude No. 102	13.2	262
Mexico gas oil	34.2	151
Mexico, crude	17.0	145
Mexico, crude	17.3	126
Mexico, crude	15.4	202
Mexico, crude, Panuco	11.7	220
Mexico, Asphaltum (road binding material)	10.0	374
Mexico, Distillate	17.6	182

Investigation was made of temperature conditions at sea with a view of determining the degree of heat necessary to take the necessary suction.

"The present navy contract oil—Oklahoma oil—ceases to flow at 12 degrees F. and at ordinary winter temperatures in ship's tanks the pumps will take an adequate suction without any preheating of the oil. The other extreme is the viscous Mexican Panuco oil, where preheating is necessary even in Mexico."

Inquiry was made of destroyers as to the temperature of oil compartments likely to become heated—compartments subject to most unfavorable conditions. Reports received from 18 vessels showed an approximate average maximum

Generated on 2024-09-12 12:05 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

temperature, in northern waters, of 88 degrees F. in the settling tanks and 80 degrees F. in the main tanks. The maximum temperature reported was 102 degrees. For the tropics a mean of 114 degrees was reported for the settling tanks and 91 degrees for the main tanks, with a maximum of 131 degrees.

HEATING AND PUMPING TESTS

Heating and pumping tests were conducted under the following conditions:

"The Board estimated that the standard Blake pump used in the test, which conforms with the installation on board ship, requires that this pump should deliver 564 gallons per hour, in order to secure an adequate amount for full power. This, then, is taken as the standard of comparison in determining the temperatures to which oil must be heated in order that the suction pumps may supply an adequate quantity for full speed.

"In conducting the pumping tests three grades of Mexican crudes were used—the 15-degree 4, the 17-degree 5, and the 11.7 Baumé, the latter representing the extreme case of viscous oils on the market. The pumps used were the Blake pump of the type in ordinary use in the service, the Kinney rotary pump, and the May-Nelson rotary pump. The suction was taken from the 12,000-gallon submerged oil tanks with about an 8-foot lift through about 100 feet of 3-inch piping bushed down to 2½ inches at the pump.

"The following results were obtained:

Temperature	Toltec, Mexican, 12° B., gallons per hour	Mexican, 15° .4 gallons per hour	Mexican, 17° .3 gallons per hour
65	87	...	417
73	126	226	...
75	130	376	1,105
80	173	717	1,414
90	295	1,365	1,997
100	458	1,904	2,546
110	683	2,486	2,970
120	987	3,000	3,348
130	1,360	3,516	3,636
140	1,775	...	...
150	....	4,190	4,063

"It will be seen from these results that the 17-degree .3 Mexican oil must have a temperature of 67 degrees F. or above in order that the pumps may take an adequate supply for full speed; the Mexican 15-degree .4, a temperature of 77-degree F. or above; while Toltec (Mexican) 12-degree B must be heated to 105 degrees F. This latter result is considered by the Board as the limiting temperature. The Board ascertained that it is the practice on the Southern Pacific steamers burning this oil to heat from 115 degrees to 120 degrees F."

TEMPERATURES AT WHICH INFLAMMABLE GASES FORM

As the next step in the Board's study, investigation was made as to whether explosive or inflammable gases form in the ship's bunkers at this temperature, and further, at what temperature they do form.

"As a foreword, it may be said that the investigations showed that no inflammable gases form until the oil is heated to its flash point; and that the Abel or Pensky-Martins' flash cup gives results that check with the results obtained in the large tank (miniature bunker)."

The investigations of these features, made by Professors G. A. Hulitt and G. A. Burrell, of the Bureau of Mines, are set forth as follows:

"In order to make tests on a large scale the Board prepared a steel tank about 11 feet long and 4 feet in diameter, fitted with a steam coil for warming the oil, and a manhole on top for introducing the oil. For use, this tank was to be filled about one-third full of oil. The steam could then be turned on and the rise in temperature of the oil noted by means of a thermo-couple. At intervals and especially just before taking a sample, the tank could be rolled in a manner similar to the rolling motion of a ship, in order to disengage any oil vapors and thoroughly mix them with air. The samples could then be collected at any desired temperature and examined as to their inflammability and vapor content.

"Before attempting these large scale experiments, it was thought best to make experiments on a small scale. Consequently, bottles of oil were carried to the Navy laboratory, and there, with the gas analysis outfit Dr. Hulitt and Mr. Burrell had furnished, the small scale experiments were conducted."

As the information furnished by these preliminary tests was inconclusive, it was thought best to conduct further laboratory experiments at the Pittsburgh station of the Bureau of Mines, and the Board was asked to hold the large scale tests in abeyance until the Pittsburgh tests could be completed.

Here a more thorough investigation was undertaken of the flash point than could be accomplished by means of the Pensky-Martin flash tester. It was believed that perfect equilibrium conditions between oil vapor and air could be maintained in this device by means of a mixing arrangement contained in it, and the following apparatus was devised to better this condition:

"The oils were placed in a round bottom flask having a capacity of about 500 c.c. A three hole rubber stopper, fitting the neck of the flask, carried electrodes which extended into the flask, and a thermometer. Platinum tips were fitted to the electrodes, across which an electric spark was made to jump. The spark gap was ¼-inch wide. The glass flask was placed in a bath and surrounded by water or paraffine, depending upon the temperature to which it was necessary to heat the oil in order to cause it to give off vapors sufficient, when mixed with air, to form an explosive mixture.

"The procedure was first to about half fill the flask with oil, then to replace the moist air in the flask with dry air. The temperature of the bath was then slowly raised and at intervals a spark was flashed across the platinum terminal; the temperature being noted just before flashing the spark. Also each time before the mixture was sparked the flash was thoroughly shaken to insure a thorough mixing of the air and oil vapors.

"In the table that follows there are shown the type of oil experimented with, the temperature at which the explosion occurred, expressed in both Centigrade and Fahrenheit degrees, as determined by the Bureau and the flash point of the oil, as determined at the Navy laboratory.

"It will be noted that a rather close agreement exists between the two sets of results, indicating that the ordinary Pensky-Martin test (closed vessel), as used at the Navy laboratory, gives good results.

"The following table gives the temperature to which the oils examined can be heated before an explosion can occur. When this point had been determined the products of combustion were removed from the flask and the temperature of the oil dropped about 2 degrees C. and the flask again shaken and sparked to determine the point of flash as closely as possible.

Type of Oil	Bureau Explosion Point Temperature, Cent.	Bureau Explosion Point Temperature, Fahr.	Navy Laboratory Flash Point Temperature, Cent.	Navy Laboratory Flash Point Temperature, Fahr.
California, Star	85	185	82	180
Louisiana	130	266	135	275
Mexican Oil 17° .3	52	126	53	127
Standard Mexican Gas oil	64	147	...	151
Standard Lima oil	55	131	...	151
Mexican Crude 17° B.	70	158	63	...
Mexican Residue 10° B.	175	347	...	145
Mexican Crude, 15° .4 B.	94	201	94	202
Gulf Refining Co. Navy oil	75	167	...	171
Indiana	64	147	62	144
Illinois	60	140	63	146
California, Richmond	108	226	109	228

In the following table are shown the kind of oil tested, the temperature to which it was heated, the oxygen present in the sample of air vapor, the quantity of vapor produced at the particular temperature used, and the flash point of the oil (as determined by the Bureau of Mines):

Kind of Oil	Temperature to Which Oil Was Heated, Cent.	Temperature to Which Oil Was Heated, Fahr.	Oxygen, Vapor, Per-cent	Per-cent	Flash Point, Cent.	Flash Point, Fahr.
Mexican Crude, 17.3 Baumé	53°	127°	20.4	1.00	52°	126°
Mexican Crude, 17.3 Baumé	73°	163°	20.0	1.10		
Mexican Gas oil	23°	73°	20.8	.20	64°	147°
Mexican Gas oil	63°	145°	....	.90		
Mexican Gas oil	92°	198°	....	1.40		
Lima oil	24°	75°	20.9	.20	55°	131°
Lima oil	55°	131°	20.1	1.20		
Lima oil	77°	171°	18.1	....		
Mexican Crude 17 Baumé	55°	131°	20.7	.40	70°	158°
Mexican Crude 17 Baumé	71°	160°	20.4	.80		
Mexican Crude 17 Baumé	94°	201°	18.7	1.40		
Louisiana oil	97°	207°	20.4	.95	130°	266°
Louisiana oil	75°	167°	20.6	.70		
Navy Contract (Oklahoma)	50°	122°	20.3	.50	75°	167°
Navy Contract (Oklahoma)	75°	167°	20.1	1.00		
Navy Contract (Oklahoma)	95°	203°	19.8	1.40		
California Star oil	50°	122°	19.9	.55	85°	185°
California, Star oil	98°	208°	15.5	1.37		

Generated on 2024-09-12 12:03 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

"It will be noticed that the quantity of vapors distilled from the oil varied between 0.1 and 1.50 percent. The higher amounts represent those vapors that are given off at the higher temperature, and at the temperatures where the explosive proportions of the vapors are formed. The flash point of an oil is, of course, an indication of the temperature at which oil gives off vapors in such proportions that they form an inflammable mixture with air. If exposed to an electric flash or a flame, the mixture will ignite and the flame extend throughout the mixture, i.e., an explosive mixture of air and vapor will form. All vapors and gases when mixed with air explode, i. e., completely inflame, between certain limits, the high and low. So little or so large a proportion of the combustible part can be present that an explosion does not follow when ignition is effected at one point in the mixture.

"When oil is heated, the constituents that come off first or distill are those of the lowest boiling points. In the case of the heating of crude oil these constituents may be the following:

	Name	Formula	Explosive Limits Percent Low	Explosive Limits Percent High	Boiling Point
Gaseous	Methane	CH	5.0	12.5	
	Ethane	C2H6	3.1	8.5	
	Propane	C3H8	2.2	5.0	
	Butane	C4H10	1.65	4.0	1° C.
Liquid	Pentane	C5H12	1.35	3.0	35° C.
	Hexane	C6H14	1.10	2.0	69° C.
Liquid	Heptane	CH716	.95	1.50	98.4° C.
	Octane	CH818	.85	1.25	125.5° C.

"The laboratory experiments showed that, if any of the gaseous constituents (the first four above mentioned) were present dissolved in the oils, they were there in insignificant quantities only, what follows in the vapor—air mixtures when the oils are heated, is due to the last four, the light liquid constituents of the oil. It will be noticed that those constituents in the vapor form have very narrow and very low explosive limits (it might be mentioned that the first gaseous member, methane, is the so-called fire-damp of the coal mines). Of the four constituents that are responsible for the flash when oils are heated, two of the intermediate ones, hexane and heptane, are the ones principally responsible. Their explosive limits, it will be observed, are close to the proportions of vapor that are given off at the flash points of the oils when the latter are heated.

"An interesting development from these experiments is shown in the diminished oxygen content of the vapor-air mixtures. In other words, oil absorbs oxygen from air, especially at increased temperatures. This might continue to such an extent, in the case of an oil heated for a long time, that not enough would be left in the vapor-air mixture over the oil to support an inflammation even if the vapors were present in explosive proportions. The Bureau, in working on the explosibility of methane, has observed that when oxygen is reduced to about 13.0 percent, methane in the mixture will not explode under any conditions.

"Analyses of air samples taken in various places in the U. S. S. *Mayrant's* fireroom, settling tank and bunkers, in order to ascertain whether any explosive or inflammable gases exist under the present general conditions:

Lab. No. 4166 ..... Bottle No. 1

Remarks—From bilge pocket of No. 2 fireroom, abaft No. 4 boiler; dead fireroom; as per routine blowers had been run before sample was taken but were stopped about 30 minutes before taking sample.

CO_2	0.10
O_2	20.87
Combustible vapors	0.00
N_2	79.03
Total	100.00

Lab. No. 4167 ..... Bottle No. 2

Remarks—From after end of B-5 fuel oil settling tank; tank was very nearly full, and sample was taken just above top of oil level.

CO_2	0.17
O_2	20.77
Combustible vapors	0.01
N_2	79.05
Total	100.00

Lab. No. 4168 ..... Bottle No. 3

Remarks—From bilge pocket of No. 2 fireroom abaft No. 4 boiler; same locker as that referred to under Lab. No. 4166, also same conditions except that No. 3 sample was taken before blowers were run per morning routine.

CO_2	.10
O_2	20.82
Combustible vapors	.01
N_2	79.07
Total	100.00

Lab. No. 4169 ..... Bottle No. 4

Remarks—From A-10 fuel oil storage tank; tank was full to within 2 feet of top, and sample was taken 1 foot above oil level.

CO_2	.04
O_2	20.48
Combustible vapors	.04
N_2	79.44
Total	100.00

Lab. No. 4170 ..... Bottle No. 5

Remarks—From bilge pocket just forward of No. 2 boiler; No. 1 boiler steaming at the time under one burner for auxiliary purposes; one blower in use.

CO_2	.05
O_2	20.92
Combustible vapors	.01
N_2	79.03
Total	100.00

Lab. No. 4171 ..... Bottle No. 6

Remarks—From bilge pocket forward of No. 3 boiler; underway with 5 burners in use on No. 3 boiler and 4 on No. 4 boiler; both blowers in use making 1,600 revolutions per minute.

CO_2	.02
O_2	20.84
Combustible vapors	.01
N_2	79.13
Total	100.00

"It will be observed that the combustible vapors are insignificant. Almost a 0.9 percent of the vapor must be present, in a mixture of vapor and air, to form an explosive mixture. The largest amount found was 0.04 percent."

Six samples of air-vapor mixture were collected at the League Island Navy Yard under the following conditions:

"A large tank, already mentioned, was one-third full of Texas Company, Mexican crude oil, flash point 126 degrees F. 53 degrees C. and was heated by means of a steam coil. The tank was rolled through an angle of 45 degrees in order to mix the vapors and air. The temperature was controlled by means of a thermo-couple. This was checked against a mercury thermometer.

"The results of analysis follow. By "straight" sample is meant that in collecting a sample it was not diluted with air, as was the case in the collecting of some samples. In case of the collection of some samples, dilution with air in the sample was performed to avoid possible deposition of the vapor that should follow if the difference of temperatures between the tank interior and the sample tube was too great.

Remarks—Texas Co. Mexican crude; tank one-third full; heated to temperature 100 degrees F. from room temperature; with rolling for 5 minutes.

ONE-HALF AIR

Lab. No. 4206 ..... Bottle No. 1

CO_2	0.26
O_2	20.61
Combustible vapors	0.17
N_2	78.97
Total	100.00

STRAIGHT

Lab. No. 4207 ..... Bottle No. 2

CO_2	0.13
O_2	20.72
Combustible vapors	0.28
N_2	78.97
Total	100.00

STRAIGHT

Lab. No. 4208 ..... Bottle No. 3

CO_2	0.10
O_2	20.63
Combustible vapors	0.15
N_2	79.22
Total	100.00

Remarks—Temperature 127 degrees F. rolled 25 minutes.

ONE-HALF AIR

Lab. No. 4209 ..... Bottle No. 4

CO_2	0.29
O_2	19.58
Combustible vapors	0.51
N_2	79.62
Total	100.00

STRAIGHT

Lab. No. 4210 ..... Bottle No. 5

CO_2	0.20
O_2	20.19
Combustible vapors	0.41
N_2	79.20
Total	100.00

Generated on 2024-09-12 12:02 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Straight	
Lab. No. 4211	Bottle No. 6
CO_2	0.18
O_2	20.24
Combustible vapors	0.41
N_2	79.17
Total	100.00

"The sample of Mexican crude petroleum oil was left in the large testing boiler for two months. The tanks were 1/3 full of oil and 2/3 of the space was occupied by air and vapor left from the test in which the oil was heated to the flash point. The boiler was closed and stood at room temperatures. The test showed:

CO_2	0.08	0.09
O_2	20.61	20.60
Hydrocarbon vapor	0.04	0.04

"It will be observed that the highest amount of vapor was 0.51 percent, found at the flash temperature (126 degrees F.). This quantity in air is not enough to insure an explosive mixture. The fact that at the temperature of flash, an explosive proportion of vapor was not found (as should be the case if laboratory experiments are correct) can be explained on the assumption that the mixing operation on the large scale could not be performed thoroughly enough to produce a uniform mixture of vapor and air in the tank. In other words, the vapor content just over the oil surface was probably high (higher than explosive proportions), while that where the sample was collected (about one-half the distance from the top of the tank to the oil surface) was too lean. At the conclusion of the heating when the temperature of the oil was still 126 degrees F. the manhole cover was quickly removed, and a large lighted torch thrust into the interior of the tank to see if any inflammation would follow. None was observed. This experiment checks the laboratory tests of the samples, in that at least in some parts of the tank an explosive mixture of air and vapor was not present.

"In regard to the question whether the flash points submitted can be accepted absolutely as those temperatures to which the oils could be heated before danger from ignition of the vapors given off would follow in any shape or form:—

"To answer, a further elaboration of the definition of the term 'flash point' must be given. Suppose a mixture of oil vapors and air was being tested for it's flash point with a flame. It would be found that at a temperature below the flash point, the flame, as it was exposed to the oil vapors, would be surrounded by a pale halo, which would gradually increase in intensity until a sudden inflammation or gentle explosion of the vapors occurs. This point of complete inflammation is called the flash point. The next point, the so-called burning point, is that temperature at which the oil ignites and continues to burn. It can be stated that at the temperatures below the flash point, one would get, if the flame were exposed to the vapors, a partial inflammation that would not extend through the mixture. This inflammation (blue haze) would take the nature of a slow flame extending only part way into the vessel where the oil vapor had lodged. It would then extinguish itself for lack of further fuel to feed upon. More vapor would then accumulate, however, and again a flash would occur if a flame were again applied. The point at which this little halo first appears, in the case of the laboratory experiments, is usually from 10 degrees C. to 30 degrees C. (50 degrees to 56 degrees F.) below the complete flash point. Probably 15 degrees C. (59 degrees F.) is a good average."

Conclusions

The following conclusions are reached:

"(1) At the flash temperatures the vapors produced constitute about 1.0 to 1.25 percent of the mixture of air and vapor. They consist principally of vapors of the liquid paraffine, hexane and heptane.

"(2) On board ship these oils can be heated to within about 15 degrees C. (59 degrees F.) of their flash point before even a noticeable halo or partial burning occurs should they be accidentally inflamed.

"(3) The flash points shown herein are a good indication of the temperature to which the oils can be heated before an explosion of the released vapors can occur."

The final conclusions of the Board on the subject of "flash point" are interesting and valuable, for, as indicated by the foregoing, they have been arrived at after thorough and exhaustive study, and are logical conclusions.

General Conclusions

(1) It is not necessary to heat any known fuel oil now found on the market to a temperature above 105 degrees F. in order to obtain free flow and adequate suction with the type of pumps, piping, etc., installed on board naval vessels.

(2) No inflammable or explosive mixtures are formed when a tank of oil is heated to this temperature by a steam coil, nor are they formed at any temperature below the flash point.

(3) The minimum of 150 degrees F. flash point, as obtained with the Abel or Pensky-Martins' cup, is safe, and further has an adequate margin of safety.

Oil Engine Designed to Operate on Progressive Combustion Principle

An experimental heavy oil engine which employs the Brayton heat cycle has been developed in the shops of the W. and A. Fletcher Company, Hoboken, N. J., by Lieutenant Commander John H. Barnard, U. S. N. R. F., in association with Mr. H. N. Fletcher, vice-president of the Fletcher Company. An indicator card from this engine is shown in Fig. 3 while another diagram showing the performance of the engine under varying periods of sustaining the initial pressure is shown in Fig. 4. Figs. 1 and 2 are reproductions of two of the drawings forming part of the designer's application for foreign patents. The latter illustrations represent one-half of a four cylinder single acting engine designed to work at 175 pounds per square inch initial pressure and to develop 350 brake horsepower at 150 revolutions per minute. Fig. 5 represents the calculated indicator card of this engine in developing 350 brake horsepower when expanding down to a terminal pressure of 20 pounds above atmosphere.

Fuel Burns at Constant Pressure

The reason that these diagrams show no compression line is due to the fact that this engine employs the heat cycle conceived and employed by George B. Brayton, of Philadelphia, years in advance of the Otto and succeeding foreign cycles. In this the air of combustion is compressed by an auxiliary cylinder into a receiver from which it is admitted to the power cylinders, with a fuel content, during a fraction of the power stroke and during this period the fuel burns without explosion at substantially constant pressure.

As the thermodynamics of this cycle show it to be superior per degree of compression employed to other cycles, it has long offered reasonable fuel economy with the commercial advantages of moderate pressures, but, as Sir Dugald Clerk states in his 1916 edition of "The Gas, Petrol and Oil Engine," "No one, however, has yet succeeded in carrying his (Brayton's) type of engine further than he did" and, indeed, it has cost many months of continuous effort to evolve the engine here described.

The experimental engine from which the actual cards were taken has a single acting power cylinder of 8-inch bore and 10-inch stroke with inadequate means of sustaining more than 64 or 65 pounds air pressure, but this has sufficed to solve the difficulties encountered and to support the theories deemed fundamental in the problem. This work, too, has afforded an understanding of the principles to be followed in the proportioning of parts, the data permitting the calculation of the card shown in Fig. 5.

Construction of the Engine

Fig. 1 shows the two single acting power cylinders *A* and *B* of the double acting two-stage air compressor, of which *C* is a water cooled first stage cylinder and *D* a lagged second stage cylinder. Free air, taken into the first stage cylinder, is compressed into an inter-cooler where it is reduced to about atmospheric temperature and whence it is taken by the second stage cylinder and compressed into the receiver *E* at 175 pounds per square inch gage and at about 340 degrees Fahrenheit. From the receiver this air reaches the mixing chambers *F* and *G* above the admission valves *H* and *I*. In the mixing chambers are located the spray noz-

Generated on 2024-09-12 12:02 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

zle, one of which is shown in some detail in Fig. 2 with its discharge orifice *L* directed towards the entrance to the valve.

In order to secure any definite mixture of fuel and air and to secure the uniformity of pressure evident from the admission line shown in Fig. 3, the opening of the valve

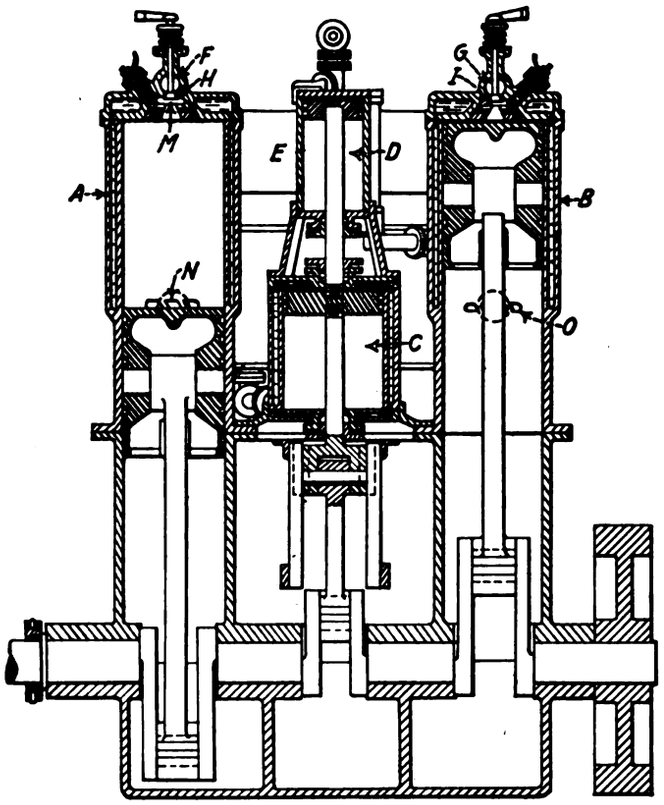


Fig. 1

must be accurately regulated with a correspondingly governed delivery of the fuel and a thorough pulverization of the fuel through an extremely wide range of fuel delivery.

Cycle of Operation

The power cylinders follow the 2-stroke cycle and as no compression is effected in them there is not only no demand for any specific clearance but, as clearances must be filled, these are minimized as carefully as in well designed compressor cylinders. At top center the pistons just miss contact with the cylinder covers, so that, during the power

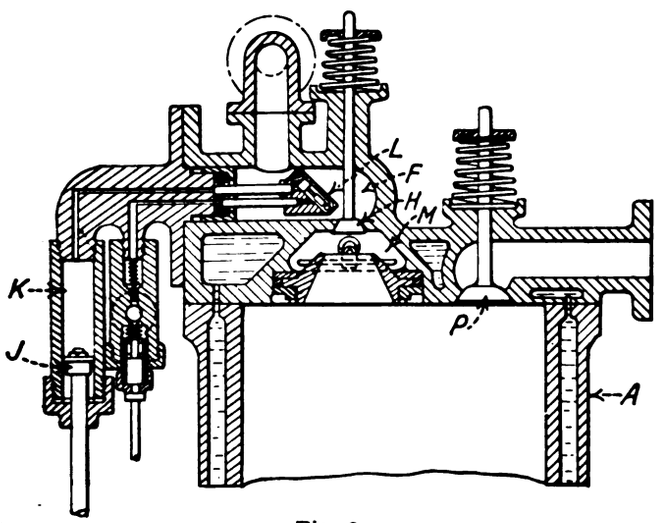


Fig. 2

stroke, the volume above the power pistons is very strictly proportional to the amount that the pistons have traveled.

The admission valves begin to open just enough before the piston reaches top center to fill the limited clearance and to

Fig. 3.—Indicator Card Made by 15 Consecutive Strokes of Experimental Engine

Spring, 1 inch = 60 pounds pressure; receiver pressure, 64 pounds; speed, 128½ revolutions per minute.

cushion the piston. Through the period of follow these valves continue to change the amount of their opening and this is effected by a cam whose profile is calculated to govern this to an amount proportional to the *change* of speed of the power piston. Likewise, the rate of fuel delivery is produced by a cam whose profile is calculated to drive the fuel pump plunger at a rate which is proportional to the *speed* of the

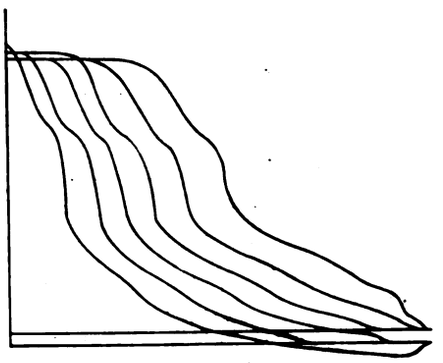


Fig. 4.—Indicator Diagrams with 6 Different Lengths of Follow

Spring, 1 inch = 40 pounds; receiver pressure, 61 to 63 pounds per square inch.

power piston. In consequence, the richness or leanness of the mixture is constant during the period of admission and, by adjustments in the amount of the pump throw, this can be set according to desire.

Returning to the sequence of operation, at the moment the admission valve begins to open the spray of fuel commences into the stream of compressed air rushing through to the combustion chamber *M* in Fig. 2. In this turmoil each particle of fuel is borne by the fresh air necessary to its

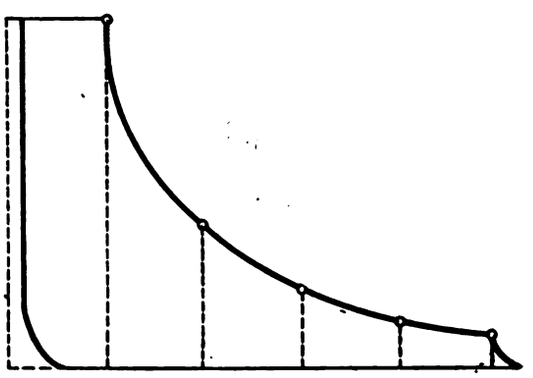


Fig. 5.—Calculated Card for 175 Pounds Pressure

Generated on 2024-09-12 12:28 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

combustion and no particle has to seek its quota of oxygen. Entering the combustion chamber the stream is caught by a heat insulated baffle near the bottom of which is an electrically heated resistance wire. Instantly the first of the fuel is ignited and the heat generated multiplies, at approximately receiver pressure, its accompanying air by a factor dependent upon the richness of the mixture. To satisfy this increase of volume it can only pour over the lip of the baffle into the space above the power piston.

Into this counterflowing flame there follows the remainder of that particular charge, exerting on the piston no explosive effect but a constant pressure only a few pounds less than that above the admission valve.

Upon the closing of the admission valve, with the simultaneous cessation of the fuel delivery, the products of combustion expand rather adiabatically until the pistons uncover the ports *N* or *O*, releasing nearly all of them while the small remainder is lowered in temperature by their extended expansion. Before the piston, on its return stroke, has again covered the exhaust port, the auxiliary exhaust valve *P* is opened, through which practically all the balance of the old charge is displaced before the valve closes. In this way this 2-stroke cycle cylinder is more thoroughly scavenged, it is claimed, than any 4-stroke cycle cylinder can possibly be scavenged. After a few strokes the insulated baffle becomes sufficiently heated to originate ignition and the electric current may be cut off.

In order to accomplish thorough pulverization through the excessive range necessary, nearly every form of spray nozzle generally known has been tried and many others designed to magnify recognized means of shattering the fuel and it was early learned that a slight aeration during the process was decidedly helpful. To this end there is operated, by the cam which actuates the fuel pump, the air plunger *J* in the barrel *K*. During the suction stroke of this plunger its barrel is filled through the orifice *L* with air from the mixing chamber which is, of course, at receiver pressure and temperature. With this and the form of nozzle finally devised there can be sprayed extremely viscous fuels with remarkable success and a special application is on file in Washington for this arrangement for Diesel engines and other purposes.

Special Features

There are a number of details in connection with this engine of more than passing interest. One is that instead of compressing a fixed amount of air for each stroke in each cylinder there is compressed only an amount proportionate to the length of follow which at any moment is being employed. Another is that in addition to no particle of fuel having to seek its quota of oxygen it is also true that there is no necessity for any propagation of the flame because the fuel is brought *progressively* into the flame and there is hardly any limit to the leanness which may be employed. A third point is that this engine will operate and develop its torque at remarkably low piston speeds and this affords surprising flexibility. A fourth point is that no special starting or reversing valves or mechanisms are requisite because it starts in either direction as an air motor under the same valves it employs as an internal combustion engine. Still a fifth point is that there appears no reason why full receiver pressure may not be sustained through a full 180 degrees of crank angle and may not therefore supply the heavy starting torque requisite in direct connection of an engine to the driving wheels of a locomotive.

While it cannot be contended that any engine working at an initial pressure of only 175 or 200 pounds can actually rival in fuel economy engines employing compressions of 450 pounds, yet it is claimed that final, or overall, economy does not rest upon whatever difference there may prove to be between this engine and some other of slightly higher thermal efficiency.

Advantages Claimed

Some of the claims for this engine which the makers believe to be true are:

(1) Its calculated weight per brake horsepower should be considerably less than full Diesels, if compared at equal revolutions.

(2) Its more limited range of piston pressures and other reasons lessen its mechanical and thermal stresses.

(3) Its production costs, per pound of weight, should be lower because it can be built in any shop capable of good steam engine production, the metallurgical requirements are less rigorous, the tolerances are less exacting and there are eliminated the costs of special starting and reversing devices and of spray air and of scavenging compressors.

(4) Its satisfactory performance at low rotational speeds adapt it to employment with more efficient forms of screw propellers, especially in full-lined single screw ships.

(5) Its limited range of piston pressures and the elimination of spray air compressors should lessen the maintenance charges.

(6) Its simplicity of parts and its extreme flexibility should appeal to operators.

Barges Built with Sea Sled Type Hulls

FOUR barges, 97 feet long by 17 feet beam, with sea sled type hulls have been built under license from the Sea Sled Company, Ltd., West Mystic, Conn., for the Philadelphia Paper Company. This type of hull was adopted to minimize wave formation in narrow canals where previously the speed of barges had been limited, not by the power necessary to tow them but by the washing out of banks. According to reports from the owners, the sea sled type barges not only have permitted towing at higher speeds but have shown a very substantial reduction in power required over the regular type barges for the maintenance of a given speed.

In the sea sled type motorboat hull, which is the prototype of the sea sled type barge, the sides of the boat are practically parallel forward and end in a wide bow. The

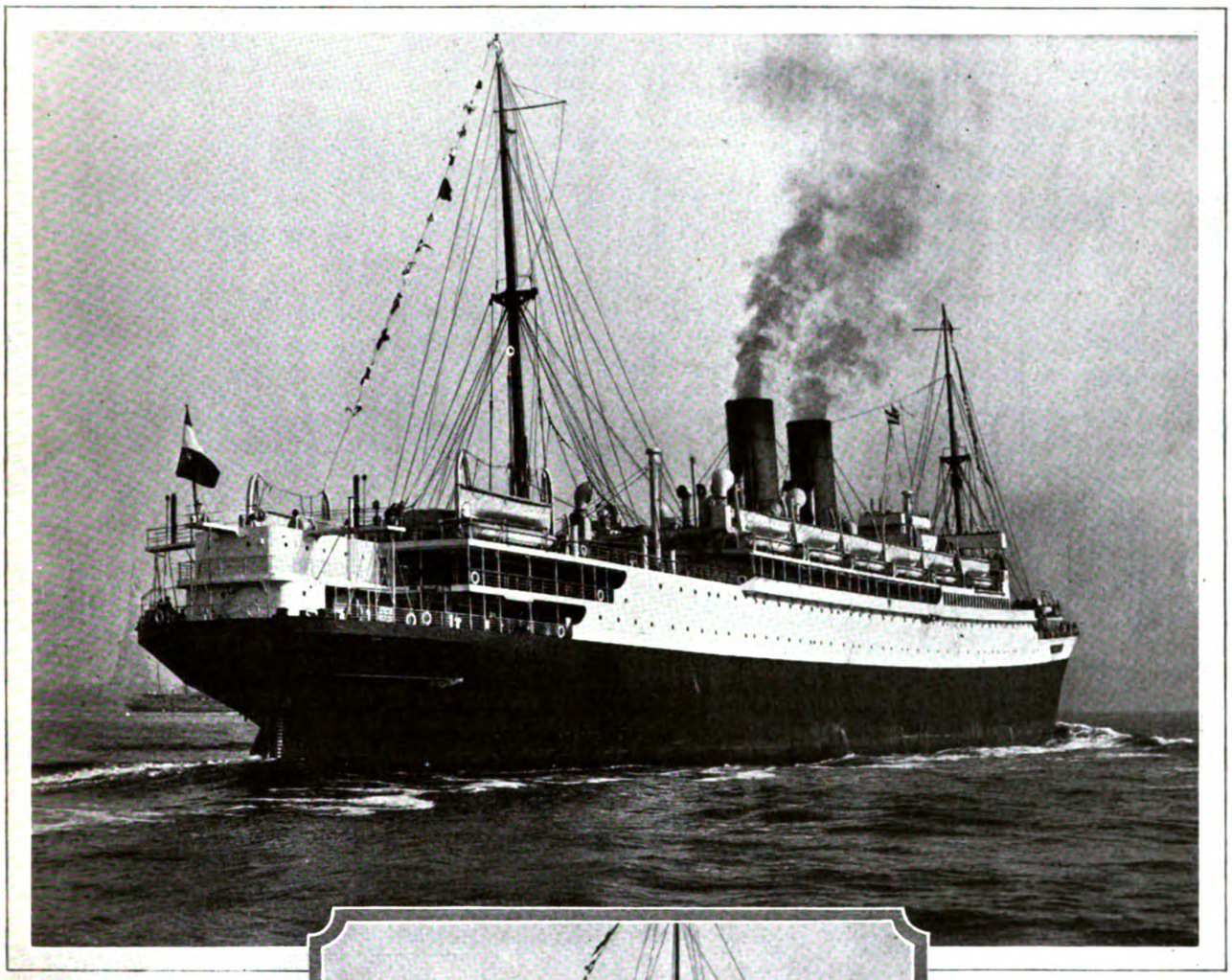
Sea Sled Type Canal Barges

bottom is of inverted V-section throughout, the chines being lower than the keel and the included angle at the keel varying from end to end, the forward section being sharpest. Aft, the keel is lowered to give almost flat sections so that the capacity of the hull is not substantially reduced from that of a scow shape of the same dimensions. Forward, the waterlines of both sides and bottom, instead of being curved inward toward a vertical stem, are curved outward, the effect of which is designed to practically eliminate the bow wave.

Generated on 2024-09-12 12:02 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

French Liner De Grasse Enters New York-Havre Service

Photographs of the Latest Vessel to Be Added to the French Line Fleet Entering New York Harbor on Her Maiden Voyage



The De Grasse is a twin-screw passenger and cargo steamer, 571 feet long, 71 feet molded beam and 46 feet 6 inches depth molded to D deck, with a gross tonnage of 17,000 and accommodations for 452 cabin and 1,722 third-class passengers.

The vessel is propelled by twin screws driven by Parsons single reduction geared turbines supplied with steam at 200 pounds pressure by 10 single-end oil-fired Scotch boilers working under forced draft. The total horsepower is approximately 11,500.

Generated on 2024-09-12 12:02 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Measuring the Towing Power of Tugs*

Pull Determined by Raising Towing Hawser Definite Amount at Some Point and Weighing Resulting Vertical Forces

By Dr. G. Kempf

IN tug work the absence of a suitable dynamometer is frequently regarded as sufficient justification for the neglect of towing measurements: the initial expense and the non-suitability for service conditions probably explain this absence. A simple method by which the towing power of a tug has recently been successfully and accurately measured without necessitating any material preliminary preparation or any expensive instruments is thus of some value. In view of the simplicity and possibilities of the method an outline description should prove of some interest.

The pull in a hawser can be most simply determined by hanging a weight on the hawser and measuring its deflection. This method is not suitable in practice because of the difficulty in accurately measuring the deflection. Much more accurate and practically applicable is the analogous method in which the hawser is raised through a definite amount at some point and the resulting vertical forces weighed on an ordinary weighing machine. In practice the method takes the following form: On the poop of the tug an ordinary weighing machine is placed under the towing hawser. On the platform of the machine and supporting the hawser is a wood strut. This strut must be sufficiently long to ensure that the hawser does not rest on any other support between its ends. Once the strut is placed in position the reaction is accurately weighed. Next a second and longer strut is placed in position and the new reaction weighed. Finally the weight of the struts themselves are noted and the distance from the strut to each end of the hawser is measured. Sufficient data are now at hand to calculate the pull in the hawser. Fig. 1 shows the scheme of the method and also the corresponding force diagram.

All that is necessary therefore to determine the pull in the tow rope is a weighing machine with weights, a two-foot rule, wood struts and a saw in order to adjust the height of the struts in any particular case. The following example illustrates the application of the method. The example refers to the determination of towing power of a tug towing two barges at a speed v = 4.9 knots. From the experiment the following data were noted:

Temperature of water	t = 8.8 degrees C.
Machinery power (indicated)	P_i 310.
Total length of hawser	L = 230 feet.
Lengths to strut	a = 49, b = 181 feet.
Difference in heights of struts	h = 1.32 feet.
Difference in weight of struts	q = 2.20 pounds.
Short strut reaction	p_1 = 117 pounds.
Long strut reaction	p_2 = 260 pounds.
Reaction difference	$p = p_2 - q - p_1 = 140.8$ pounds

Referring to Fig. 1 and taking moments about A we have

$$p\,a = Z\,d; \text{ and since } d = \frac{L\,h}{b}$$

$$Z = \frac{p\,a\,b}{L\,h} = \frac{140.8 \times 49 \times 181}{230 \times 1.32} = 4{,}100 \text{ pounds.}$$

The accuracy and reliability of the method is good since all length measurements can be made correct to 1 percent and the weights can be similarly accurately taken when the vessel is on a straight course. Calibration errors common to spring dynamometers are eliminated.

Once the towing pull is obtained the towing efficiency can be simply calculated from the well known expression:

$$\frac{\text{Pull} \times \text{Speed}}{\text{Machinery Power}} = \frac{Z \times V}{326 P_i}$$

In the above example the efficiency thus becomes

$$\frac{4100 \times 4.9}{326 \times 310} = 0.203.$$

In making use of this expression for the comparison of towing efficiencies it should be remembered that tugs which also carry some cargo should not be compared with the ordinary tug on this basis. The towing efficiency of the cargo tug is naturally less than that of the ordinary tug because a greater part of its propeller power is required for self propulsion thus diminishing the reserve for towing purposes. To effect this comparison the expression $\frac{\text{Ton miles}}{\text{Total costs}}$ is to be preferred, at least for average powered tugs.

When the tug is moored to buoys or to the quay, the dead pull so measured cannot be used in the above expression for towing efficiency because the speed is then zero. The expression $\frac{\text{Pull}}{\text{Power}}$ is in this case frequently used but it should be remembered that it is not dimensionless and is therefore

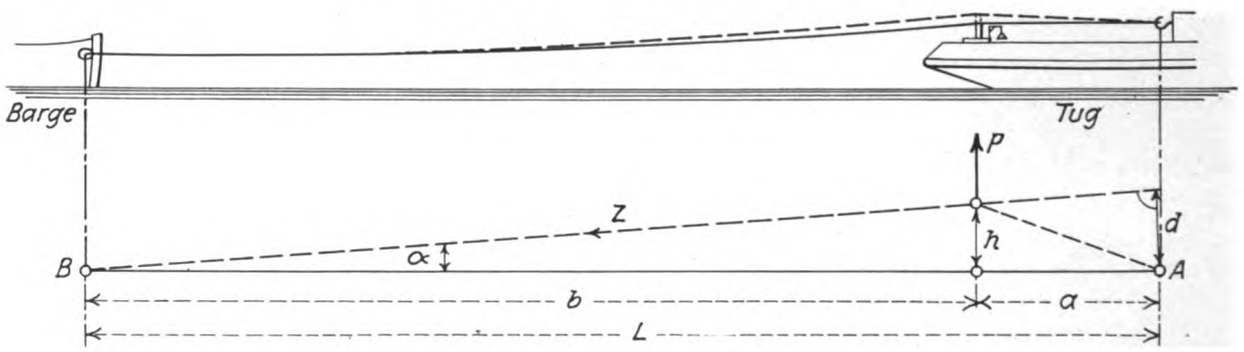


Fig. 1.—Method of Measuring Tow Pull with Weighing Machine

*Published in *Werft Reederei Hafen*, May 7, 1924, and translated from the German by E. V. Telfer, M. Sc., A. M. I. N. A.

Generated on 2024-09-12 12:06 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

not constant for similar tugs. For example it is, for the same propeller dimensions, inversely proportional to the revolutions while for the same revolutions it is inversely proportional to the dimensions. The expression $\frac{Z}{P_1}$ should therefore be used with great caution both by the builder for design purposes and the owner for operating purposes. A better criterion for this comparison is what is known as the stationary efficiency, a criterion which has long been used in aircraft work instead of the variable factor $\frac{Z}{P_1}$.

To calculate* the stationary efficiency of a screw we must answer the following questions: "Given the diameter and power of a screw, what is the maximum stationary thrust?"

Let the area of the slip stream be a, the screw disk area $A = 2a$, the specific gravity of the water γ the acceleration due to gravity g, and the mean axial speed in the slip stream v. We have, therefore

$$T = a \times \frac{\gamma}{g} \times v^2; \quad P_p = a \times \frac{\gamma}{g} \times v \times \frac{v^2}{2}; \quad \frac{T}{P_p} = \frac{2}{v};$$

$$\therefore v = \frac{2P_p}{T}; \quad T^3 = A \times P_p^2 \times \frac{2\gamma}{g}$$

$$\therefore \frac{T}{A} \times \left(\frac{T}{P}\right)^2 = \frac{2\gamma}{g}; \text{ where } \frac{T}{A} \text{ is the thrust per unit disk area.}$$

Thus for the expression $\frac{\text{Thrust}}{\text{Power}}$ we have

$$\frac{T}{P} = \sqrt{\frac{2\gamma}{g}} \times \frac{1}{\sqrt{T/A}}$$

$$\therefore \frac{T\sqrt{T}}{P} = K \times \sqrt{\frac{\gamma}{g}} \times \sqrt{\frac{D^2\pi}{4}}$$ where K depends upon the units used for T and P.

$$\therefore \frac{T\sqrt{T}}{PD} = \frac{K}{2}\sqrt{\frac{\gamma\pi}{g}}$$ and with T in pounds this reduces to

$$\frac{T\sqrt{T}}{P\,D \times 945} = 1 \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

For an efficiency of unity we can get from expression (1) the thrust that can be obtained for given loading $\frac{\sqrt{T}}{D}$ and power P. For any measured value of Z the efficiency η_z can thus be calculated from

$$\frac{Z\sqrt{Z}}{P_1 D \times 945} = \eta_z$$

This efficiency is built up as follows

$$\eta_z = \eta_m \times \eta_h \times \eta_p$$

η_m is the efficiency of the machinery and shafting.

η_h is the efficiency of the vessel's form, i.e., its influence on the pull occasioned by the propeller suction.

η_p is the stationary efficiency of the propeller.

The efficiency of the vessel's form in the stationary condition, where wake is absent, is only affected by the propeller suction. The suction reduces the effective thrust by from 5 to 10 percent and thus the towing pull is less than the screw thrust by this amount. If we assume average values for these various efficiencies, i.e.:

$\eta_m = 0.85$; $\eta_h = 0.95$ and $\eta_p = 0.60$

We have therefore

$\eta_z = 0.85 \times 0.95 \times 0.60 = 0.485$

*The method is due to Von Karman & Bendemann.

From the value of the stationary efficiency thus calculated from the tow pull we have a convenient means of assessing the usefulness of a tug. The same cannot be said of the more usual expression $\frac{Z}{P_1}$.

In Table I and Fig. 2 the towing efficiency of M.108 (a 150 indicated horsepower tug whose trial data Dr. Schaffran has published) has been calculated. In the formula for towing efficiency we can express thrust and power in terms of the constant system. Thus

$$T = c_1 n^2 D^4; \quad P = c_2 n^2 D^5 2\pi;$$

Hence we have $\eta_z = \frac{c_1\sqrt{c_1}}{c_2 \times 79.5}$ (metric units)

From this formula we have calculated the stationary ef-

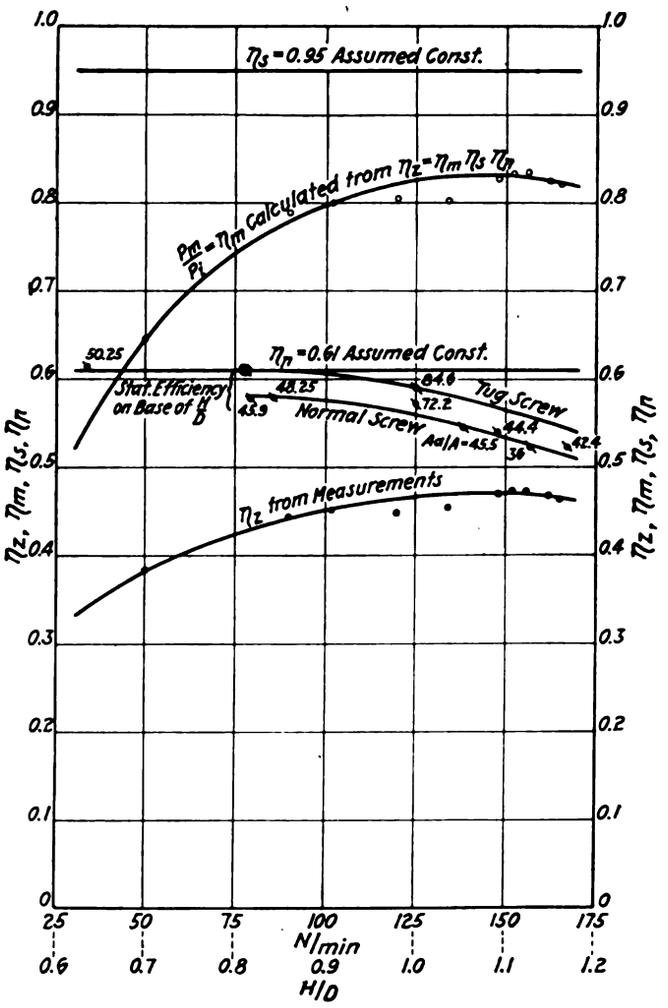


Fig. 2.—Stationary Efficiency of a 150 Horsepower Tug and Various Model Screws

TABLE I

No.	Revolutions per minute	Indicated horsepower P_1	Pull Z, pounds	$\frac{Z}{P_1}$	$\eta_z = \frac{Z\sqrt{Z}}{P_1 D \times 945}$
1	50	7.56	617	81.0	0.383
2	90	33.40	1,830	54.1	0.443
3	102	46.00	2,300	50.0	0.450
4	120	70.72	3,070	43.3	0.447
5	134	99.37	3,840	38.6	0.452
6	148	129.90	4,700	36.0	0.470
7	152	140.00	4,960	35.4	0.472
8	156	150.00	5,190	34.7	0.472
9	162	163.50	5,480	33.4	0.467
10	165	176.40	5,700	32.5	0.463

Generated on 2024-09-12 12:20 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

ficiency for the various propellers used and in Fig. 2 we have plotted the results on a base of face pitch ratio $\frac{H}{D}$. The stationary efficiency and hence the towing efficiency of a propeller can be clearly seen from this type of diagram. The well known fact shown by experience that the towing efficiency increases with increasing disk area ratio and decreasing pitch ratio is also clearly seen from the curve of stationary efficiencies.

New Type Feedwater Heater Installed in Gulf Tug Boats

A FEEDWATER heater, which was recently developed and patented by Richard Walsh of Mobile, Ala., has been installed in several tug boats operating in the Gulf of Mexico with excellent results claimed for it in decreasing the consumption of fuel.

As indicated in the illustration the feedwater heater is assembled and installed in the combustion chamber of a Scotch boiler using standard extra heavy pipe. Other installations are to be made in which calorized tubing will be used. This tubing has a longer life than standard pipe although in two instances the pipe coils have been in hard service for a year and a half without showing any signs of deterioration.

In an actual test that was made on the tug *Nimrod,* owned and operated by the Mobile Towing & Wrecking Company, the feedwater was started through a standard heater at a temperature of 180 degrees F. with the Walsh heater cut out. The steam pressure at the start was 140 pounds, the engines turning over 120 revolutions per minute. At the end of an hour steam pressure was reduced to 120 pounds and the revolutions cut to 95. The coal consumption for the hour was 1,115 pounds. At this point the Walsh heater was cut in, the thermometer showing a temperature of feedwater of 270 degrees F., the steam pressure 140 pounds, with the engines turning at 120 revolutions per minute. Throughout the hour's test on this heater the steam pressure was maintained at 140 pounds without difficulty and the engines continued to turn at 120 revolutions per minute. The amount of coal consumption in this hour's test was 942 pounds which showed a saving of 173 pounds.

Inland Waterway Transportation Abroad*

ONE of the few great industrial problems regarding which we can learn something valuable from Europe is inland water transportation. This fact has again been emphasized by observations made during the recent trip of the Special Committee of Congress to European seaports.

Those numerous canals which literally form a net-work over the territory of Holland, Germany and France play a part in the economic life of the people unlike any other form of transportation there. Not only do canals of larger size furnish highways for great barges towed by powerful tugs, but horse-drawn boats of less size are very numerous; and a common sight in the smaller canals is that of a craft with a capacity of only a few tons being pulled along its course by a man harnessed to the stern of the boat and, with a pole fixed to the bow, steering this freight carrier on its course as he walks along the bank of the canal. The service is slow, but it is so cheap and free from rail car delays that it practically eliminates the transportation problem from calculations affecting the distribution of goods handled in this fashion.

These people have realized more fully than we the necessity of continuing their inland water transportation systems as supplemental to rail service. They have abundant rail facilities for the handling of all goods which require that form of transportation, but they also have the common sense to utilize their waterways for the cheap transportation of goods which do not require hurried delivery. That is one of the lessons we can learn from these countries today.

Thrifty France has within her comparatively small territory more than 3,000 miles of canals, besides 4,600 miles of navigable rivers. The ability of this people thus to transport at a minimum of expense the products of their country, and thus secure complete and economical distribution of needed supplies, is one of the reasons why modern France always has remained a solvent people. There is a minimum of waste between the producer and consumer.

France, Holland and Germany were too wise to sacrifice their water highways to the influences of railroad transportation. England, like the United States, was at first carried away by the glamor of quick rail transportation; but she,

*From an address by E. C. Plummer, vice-chairman, U. S. Shipping Board, before Atlantic Deeper Waterways Association, Newark, N. J., September 18.

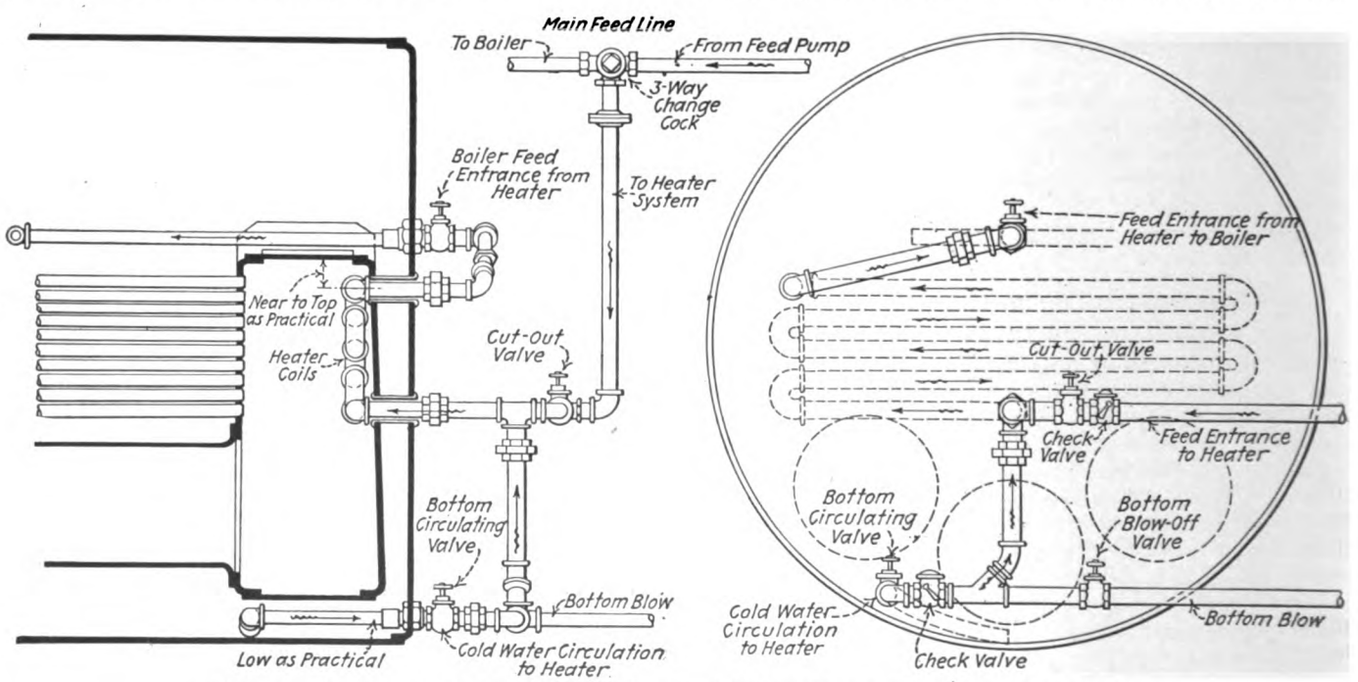


Diagram Showing Arrangement of Walsh Feed Water Heater Fitted to Scotch Boiler

Generated on 2024-09-12 12:02 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

like the United States, has come to realize the mistake that was made in sacrificing canal services as obsolete, and the report of the Royal Commission appointed to study this subject of inland waterways is of much value, for reduction in the cost of distributive transportation is now recognized by all economists as the most important problem facing the commercial world today. Every year writes its record on thousands upon thousands of tons of fruits, vegetables and other products of American fields and farms, left to rot on or in the ground, because they could not bear the freight charges, which their transportation to other parts of the country, where they are so badly needed, imposed.

The Panama Canal has made possible such a reduction in transportation charges that cargoes of fruits, which formerly could not be marketed, are now brought by ships from California to Atlantic ports. Reduced freight burdens have literally created markets for these goods. Such always will be the effect of reducing the differential between what the producer receives and what the consumer pays. With further reductions in costs of transportation, such as will come from the Dieselizing of ships and greater economies in vessel operation, the transportation burdens which those products now carry, will be further reduced; and with the perfection of a more effective system of distribution, the products of each part of our country will find a constantly increasing facility of access to all points of consumption.

Already the Government has established two important barge lines to facilitate the delivery of inland products to ocean ships in the Gulf, and the Shipping Board has assisted in providing tonnage that may utilize the Erie Canal and unite the ports of the Great Lakes with the ports of Newark and New York.

Double Acting Diesels

By Major Johnstone-Taylor

THE Diesel engine continues to make steady progress as a marine engine, most of the world's leading shipbuilders having taken up their construction.

While the saving in tonnage and space is considerable, the orthodox four stroke engine is, by virtue of its operating cycle, a comparatively clumsy machine. Two stroke engines are lighter and occupy somewhat less space, but there still remains the basic fact that the upstroke of such engines is—from a power production point of view—an idle one. Opposed piston engines of the Fullagar and Doxford class tackle this problem, but must be regarded as single acting engines designed to give a double acting effect so to speak. True double acting engines are, it is true, nothing new; such engines figure as gas engines of high power slow running variety. The double acting Diesel, however, as a commercial proposition is only beginning to make its appearance. Two British firms have produced workable designs the salient points of which will be of interest.

The North Eastern Marine Design

The North Eastern Marine Engine Company's engine may be regarded as a true direct acting double acting engine, a type which—on paper—looks easy enough to construct, but which is as a matter of fact no easy problem. Acting in conjunction with the Dutch Werkspoor Company, the North Eastern Marine Engine Company has retained in this new engine several of the essential features of the Werkspoor design. As a matter of fact the top portion of the cylinder is practically identical, with the well known reverse and starting gears and solid head.

The only addition is that of fuel, exhaust and inlet cams for the bottom, the bottom valves being actuated through levers from the camshaft by push rods. Two extra cams are fitted on the starting shaft, these being arranged to hold the bottom exhaust valve open and the bottom inlet valve shut in certain positions of the starting shaft.

Cylinder

The bottom of the cylinder is closed by a water cooled cover through which the piston rod passes, the gland being fitted with special packing. Through one side of the cover is a large port *a* (Fig. 1) which connects combustion chamber *b* to the underside of the piston. The combustion is, thus, it will be observed, quite separate from the cylinder and combustion takes place well away from the rod. Inlet and exhaust valves *c* and *d* are arranged vertically in the combustion chamber while fuel valve *e* is at 45 degrees.

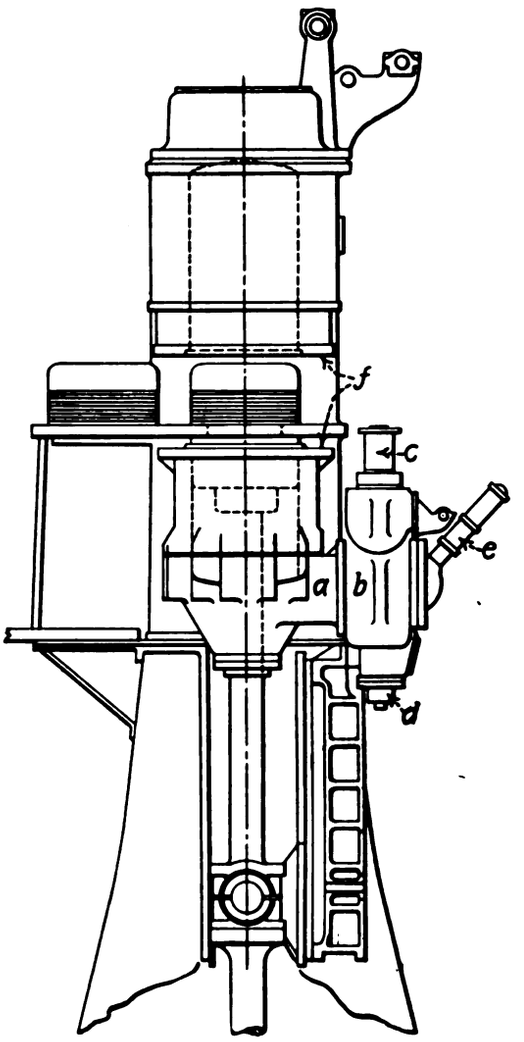


Fig. 1

The Engine

The present engine may be regarded in the light of a full size experimental unit having a bore of 31½ inches, a stroke of 55 inches and an approximate horsepower of 1,000. Four or six such units are arranged to drive onto one crankshaft. In general design it closely resembles steam engine practice, a point considered as of some importance.

Low Compression

Engineers conversant with Diesel practice will at once recognize that a compression pressure of 300 pounds is too low to permit of cold starting. This pressure was adopted from various considerations one of which was that of permitting the piston rod (always of some trouble in double-acting engines) to work at a moderately low temperature.

As a matter of fact in the unit under review piston rod difficulties would appear to have been entirely overcome

Generated on 2024-09-12 12:03 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

and the low compression is fully justified on this score. In order, however, to obtain a sufficiently high compression temperature it is necessary to supply initial heat. This is provided by the exhaust gases from the top side of the cylinder (this top side has full Diesel compression) by holding the bottom exhaust valve open as soon as the engine starts.

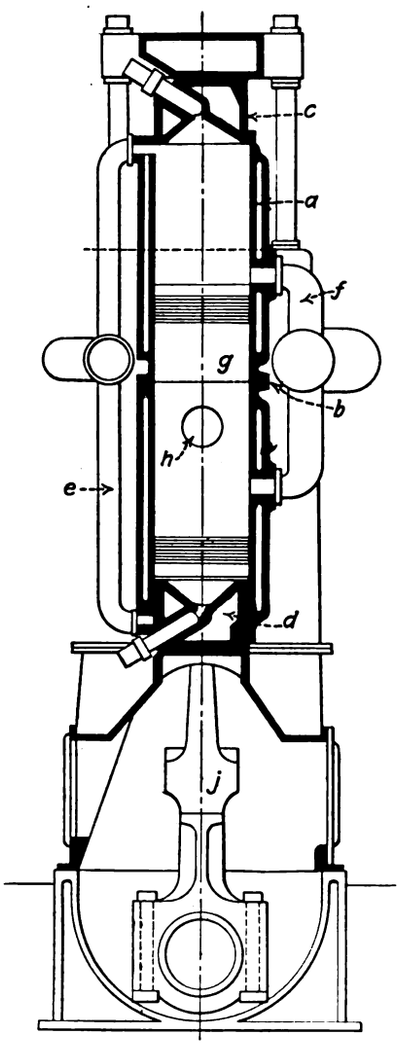


Fig. 2

The drawing in and out for a few strokes, therefore, of these gases serves to heat the lower end of the cylinder. The correct firing temperature being then indicated on the control board, the bottom part of the cylinder is allowed to fire.

Accessibility of Piston

The diagram of the engine in Fig. 1 is purposely shown with the upper half of the cylinder raised in order to show the method of removing the piston. The whole cylinder is divided by a circumferential spigotted joint, so that not only may the piston be withdrawn laterally as shown at *g* but it can be readily examined without removal. The engine, it might be noted, has been subjected to a 20 days' non-stop run on the builders' test bed and is stated to have proved entirely satisfactory in running.

The North British Design

This engine, which has created considerable interest of late, is an entirely novel proposition incorporating the sliding cylinder principle of Mr. McLagan. An engine of 2,000 horsepower having three lines of cylinders 22 inches diameter by 44 inches stroke has been thoroughly tested and is being now fitted in a motorship. A detailed description of it would take up considerable space, but the essential features are shown diagramatically in Fig. 2. Cylinder *a* is in two separate portions jointed in the middle at *b*. It has a sliding motion of some 13 inches within its covers *c* and *d*. Scavenge air branch *e* and exhaust branch *f* slide with the cylinder. Piston *g* with its extended wrist pin *h* transmit its power through forked rod *j*. The sliding motion of the cylinder serves to uncover the exhaust and scavenge ports

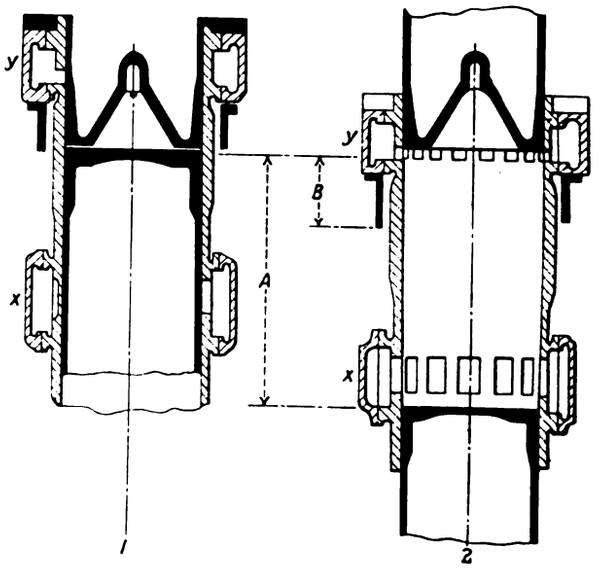


Fig. 3

at the right moment. This is shown in Fig. 3, view No. 1 showing the engine on the top dead center and view No. 2 on the bottom dead center, the exhaust ports being at *x x* and the scavenge ports at *y y*. "*A*" shows the travel of the piston and "*B*" that of the sliding cylinder.

The Sliding Cylinder

This is *the* essential feature of Mr. McLagan's design. It is reciprocated by a link gear worked from the wrist pins. Separate from one another with sufficient space between them to accommodate the relative movement of the main crosshead pin these two portions of the cylinder are joined by specially constructed ties. By the simple process of removing the ties the piston and cylinder cover may be inspected and the rings removed without drawing either piston or covers or uncoupling the connecting-rod bearings.

Ordinary cast iron is used for the cylinder jackets, although the liner is of a special high tensile brand. In form the latter is virtually a tube almost entirely surrounded by cooling water and free to expand in any direction. It will also be noted that the combustion space is symmetrical, with one small aperture for the fuel and starting air. Other features of the engine which are of interest are:

(1) The piston and cylinder cooling arrangement which supplies fresh water to the piston through an armored hose connected to the upper end of a jet pipe on which the piston inlet pipe slides.

(2) Specially designed fuel valves operated by an ingenious arrangement partly by the compression pressure in the cylinder and partly by the movement of the cylinder itself. The usual camshaft is thus entirely dispensed with while the direction of rotation is controlled by the starting air only.

On a test extending over 9 days, the engine showed a fuel consumption of 0.45 pound per brake horsepower hour when developing an average brake horsepower of 1,940 at 94 revolutions per minute.

Generated on 2024-09-12 12:02 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Practical Diesel Engineering—IV

Normal Diesel Engine Operation—Engine Room Arrangements—Preparations for Starting the Engines

By Louis R. Ford*

AFTER passing through a preliminary period of experiment and development, during which many variations in type and arrangement of engine room equipment appeared, motorship design became practically standardized on the twin screw arrangement, with one propelling engine direct connected to each propeller shaft. The number, type and location of the various auxiliaries also became pretty definitely standardized.

The twin screw arrangement has some established advantages, such as permitting the use of large powers without too great an increase in unit cylinder dimensions, use of smaller propellers that can turn at comparatively high speed, somewhat better maneuvering qualities, etc., but the fundamental reason for its use was lack of confidence in the reliability of the Diesel engine. It was felt that safety required the use of more than one engine so that if one broke down the ship would not be helpless. Since the rapidly increasing use of the Diesel engine has established its reliability on a par with the steam engine the same influences that caused the adoption of the moderate size, single screw vessel as a standard type of steam cargo carrier throughout the world are turning the tide of motorship design toward the single screw type, except in cases where the power required is beyond the practical limits of a single unit. At the present time it is rather general practice to make all engine room auxiliaries independent units but there is a growing tendency to depart from this practice and get back to old steam engine practice, attaching all the auxiliaries required for operating the main engine directly to the engine itself.

Engine Room Auxiliaries

A list of the auxiliary equipment usually located in the engine room, and the type of each generally preferred, is as follows:

Main Cooling Water Pumps—Used for circulating water through jackets of main and auxiliary engines. Usually centrifugal type, installed in duplicate and each pump large enough to supply all the water needed.

Piston Cooling Pumps—Either centrifugal or plunger type. Used for circulating fresh water or oil through pistons of main engine and installed in duplicate. If salt water is used for piston cooling, it is supplied by the main cooling water pumps.

Lubricating Oil Pumps—Either plunger or rotary type. Used for circulating oil in the forced feed bearing lubricating system and installed in duplicate.

Fuel Oil Service Pumps—Rotary type. Used for transferring fuel oil from the bunkers to daily service tanks, shifting oil from one bunker to another and sometimes fitted for use as a reserve lubricating oil pump. Usually installed in duplicate.

Bilge and Ballast Pump—A large plunger pump, the principal use of which is to pump ballast water from the ship's tanks. It has connections to the bilge for use when large quantities of bilge water are to be handled. It is also arranged with connections to the fuel oil tanks so that it may be used for shifting oil. Sometimes connected to fire mains.

Engine Room Bilge Pumps—Plunger type, for pumping bilges. Connected to fire mains and to sea so that they may be used as fire pumps or for washing decks. Usually in duplicate as a safety precaution.

Sanitary Pump—Plunger type, for supplying water to sanitary system.

Fresh Water Pump—Plunger type, for supplying fresh water to galley and baths.

Auxiliary Air Compressor—A high pressure compressor of slightly less capacity than the spray air compressor attached to each main engine. Either driven by an electric motor or attached directly to one of the auxiliary engines. Used for pumping up starting air and for supplying spray air in case of break down of one of the main compressors.

Diesel Electric Generating Sets—Generators driven by small Diesel engines to supply current for operating the auxiliaries and lighting the ship. Usually in two or three units, of such size that the maximum demand for current requires the use of all of them. Under normal conditions, when the current demand is less than maximum, one or two units are shut down. When the auxiliary air compressor is arranged for direct drive one of these generator sets is made into a combined generator-compressor set, the generator being mounted on one end of the shaft and the compressor attached to the other, with the engine between them. Each auxiliary engine has its own spray air compressor and in some recent motorships the auxiliary compressor, as a separate unit, has been eliminated, the combined capacity of these spray air compressors on the auxiliary engines being made large enough to meet the total air requirements.

Steam Boiler—A small, oil-fired boiler for supplying steam for heating the ship and distilling fresh water. The present tendency is to make this a combined exhaust heat and oil fired boiler, using the main engine exhaust to evaporate the necessary water at sea and the oil burners in port. On some ships no steam is used, the heating being done with electric current.

Evaporator and Distiller—For making fresh water. Usually the fresh water supply carried in tanks is sufficient for an ordinary voyage and the distilling apparatus is held in reserve.

Boiler and Evaporator Feed Pumps—Small, steam driven, plunger pumps for supplying feed water to boiler and evaporator. If salt water feed is used in the boiler, one pump may be made to serve both purposes. A variation found in some ships is to have the boiler feed pump operated by electric motor or compressed air.

Fuel Oil Feed Pump—Small, steam or air driven, plunger pump for supplying fuel oil to the burner under the boiler.

Emergency Compressor—A small, steam driven, medium pressure compressor, used for pumping up air for starting a Diesel electric generating set in case the starting air is lost. If no steam boiler is fitted, this compressor is motor driven with current from the emergency lighting set.

Emergency Lighting Set—A small generating set, driven by a hand started gasoline, kerosene or oil engine. Used for lighting the ship in case of emergency or when the other auxiliaries are shut down.

Ice Machine—Motor driven, vertical type machine of about one ton capacity. This size is, of course, variable with the size of the ship.

Oil Separator—Some sort of filter is usually supplied, for periodical cleaning of bearing oil that becomes dirty from repeated use in the lubricating system. The centrifugal type of separator is generally preferred.

In some ships an engine lathe, a drill press and a grinder, all motor driven, are located in the engine room. Sometimes a separate compartment is equipped as a machine shop and a more elaborate equipment of machine tools is provided.

Various arrangements of cross connections will be found in connection with the pumping equipment listed in the foregoing. The main cooling water pumps may be connected so that they supply water to the main engines, auxiliary engines, sanitary system, fire mains, or wherever sea water may be required, so that only one salt water pump is in operation normally. The bilge and ballast pumps may be connected to the main or auxiliary cooling system, or both, for emergency use. When the ballast pump is connected to the fire mains and fuel oil tanks this connection is usually made with a single short, removable section of pipe, so that when the fuel oil system is connected to the suction manifold the fire main is cut out, and vice versa.

Deck Auxiliaries

Outside of the engine room are the following auxiliaries, generally classed as deck machinery:

*Consulting Diesel Engineer, 17 Battery Place, New York.

Generated on 2024-09-12 12:05 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

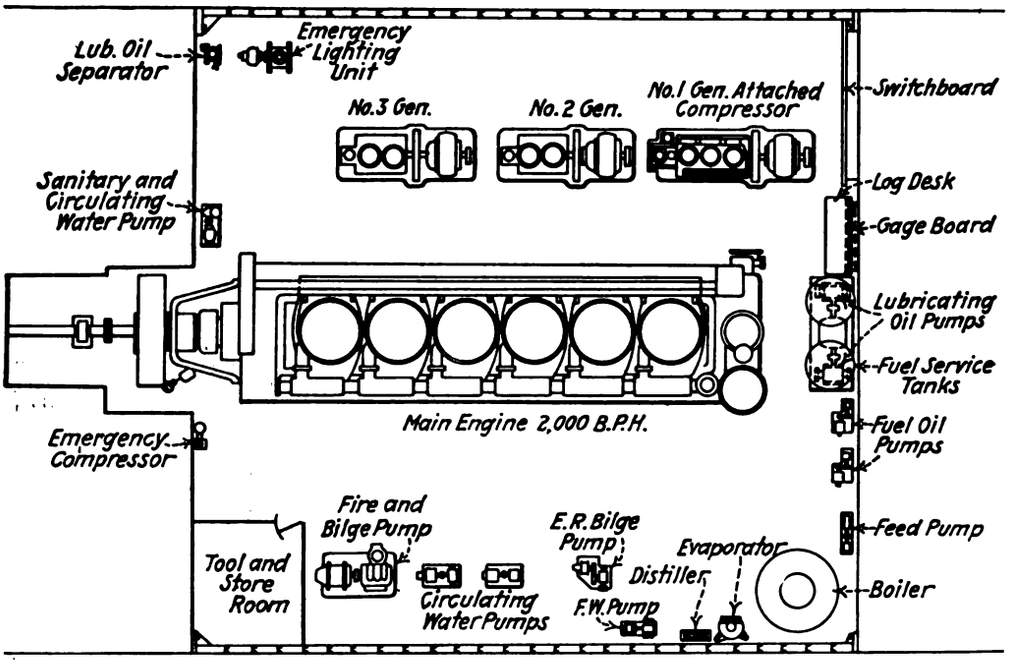


Fig. 14.—Engine Room Arrangement of Single Screw Motorship

Deck Winches—Motor driven, 8 to 14 in number, depending on the number of cargo hatches. When the contactor type of remote control for the winch motors is used the contactors may be located near the main switchboard in the engine room or grouped in a control house on the main deck.

Anchor Windlass—Motor driven. Essentially a standard steam type of windlass with electric motor substituted for steam engine drive.

Steering Engine—Either direct motor drive or electro-hydraulic type. The latter is more generally used.

Air Whistle—The old bell type of whistle is being rapidly supplanted by the diaphragm type which has the advantage of requiring less air to operate it and producing a more pleasing and penetrating sound. A motor operated air siren is sometimes used but is not suited for navigational work where short blasts, with a short interval between, are required.

Electric Lighting System—This differs from the ordinary lighting system found on steamers only when 220-volt current from the power lines is used. In that case a motor generator set is located in the engine room for changing the current from 220 to 110 volts. The reason for this is that 110-volt light bulbs are more universally available than 220-volt and have a much longer life.

Figs. 14 and 15 show a typical engine room arrangement in a moderate size, single screw, cargo ship. Fig. 16 shows a typical arrangement for a twin screw vessel of about 11,000 tons deadweight. The engine room layout in various ships will vary as to the exact location of the various units but it will be found almost universal practice in motorships equipped with electric motor driven auxiliaries to group all the Diesel electric generating sets and auxiliary air compressor on one side of the engine room and the various motor driven pumps on the other. The control station may be located at either end, on one side or on top of the engine, depending on the make of engine used. The location of the log desk, gage board and engine telegraph, is, of course determined by the location of the engine control station.

Preparations for Starting the Engines

All marine Diesel engines, except those installed in submarines, are started with compressed air and since the maneuvering of ships alongside docks or in crowded harbors and restricted channels requires quick response to signals from the bridge, and sometimes a large number of engine starts in quick succession, it is highly important that the supply of starting air and the means for renewing it be ample. The starting air is stored in tanks located in convenient places, usually suspended directly under the deck in the wings of the engine room, and on large ships these tanks may have a combined capacity of as much as 2,100 cubic feet. There will be found a wide variation in the starting air storage capacity on different ships with engines of the same size. It will vary according to the particular service for which the ship is designed, the ideas of the owners, architects and builders, etc. For ordinary seagoing motorships it will be found that a pretty good rule is to supply 35 cubic feet of starting air storage for each engine for each cubic foot of volume swept through by one piston in one power cylinder. This air is usually carried at 300 to 400 pounds pressure but in some cases the necessary capacity is secured by using smaller tanks and carrying the air pressure at about 900 pounds.

One of the valuable characteristics of the Diesel motored ship is its ability to get under way quickly in times of emergency, without much preliminary preparation, but under ordinary conditions of operation the necessity for this quick starting does not exist, and preparations for getting under way

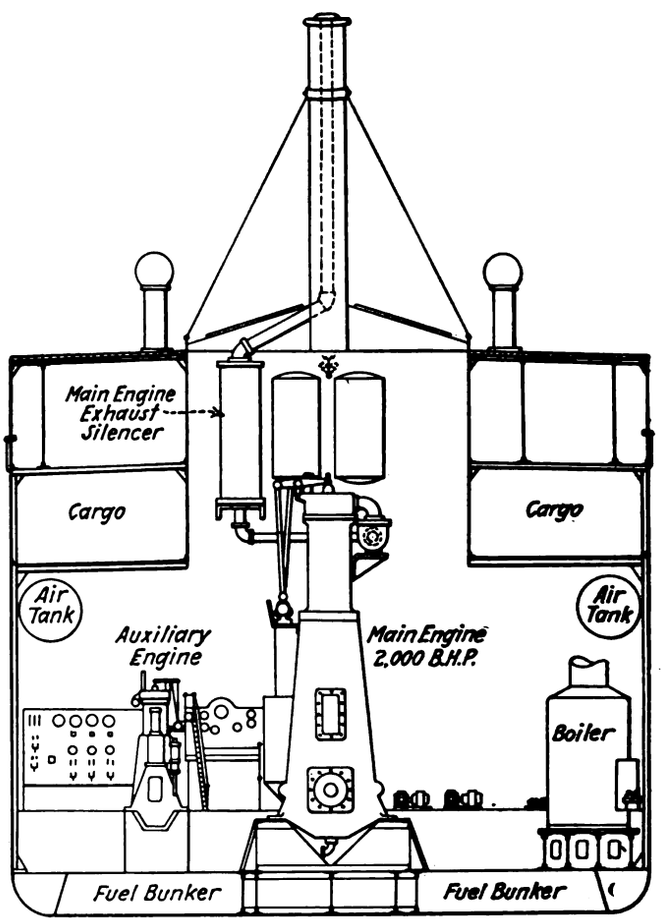


Fig. 15.—Section of Engine Room, Single Screw Motorship

Generated on 2024-09-12 12:17 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

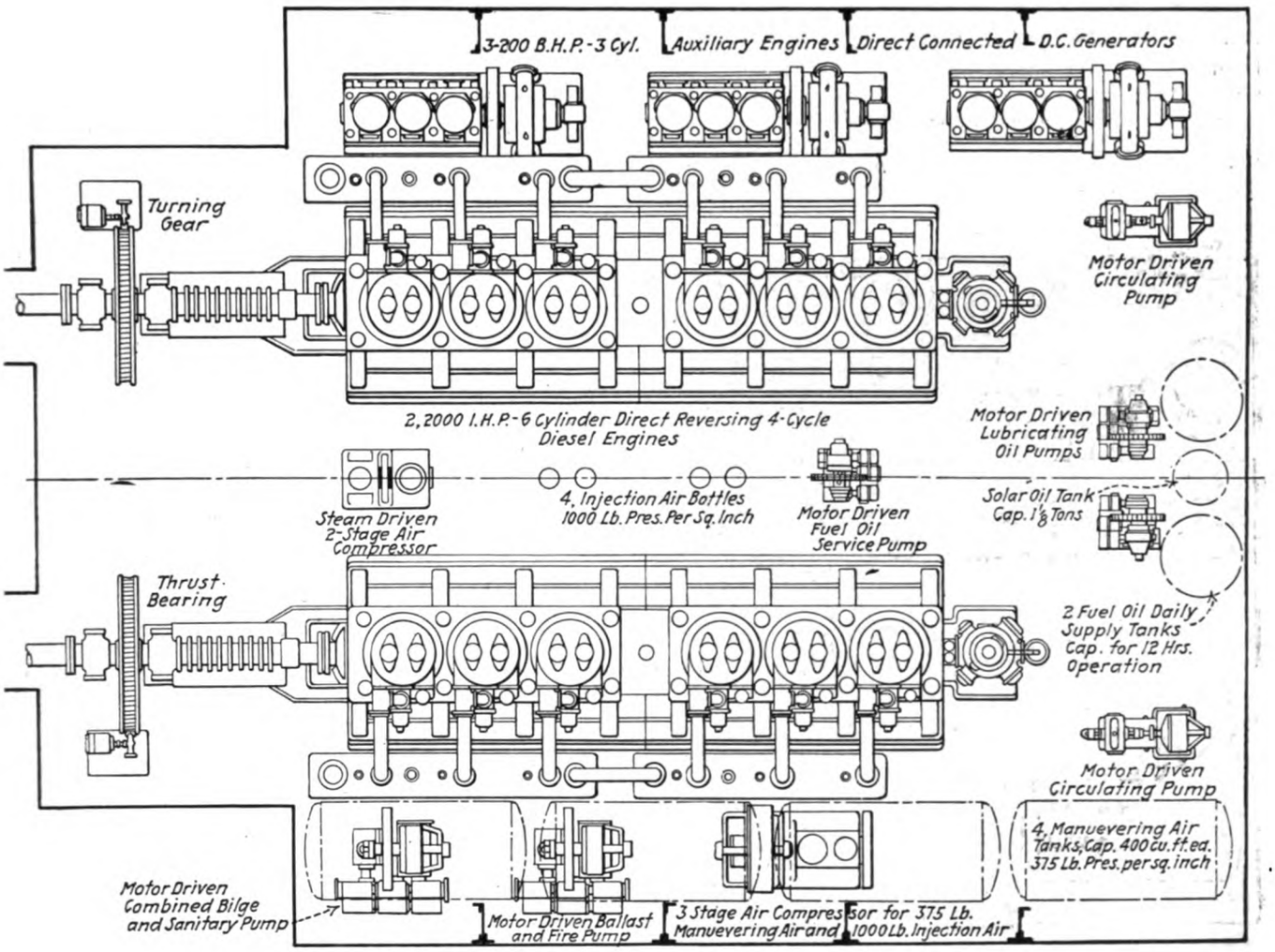

3-200 B.H.P.-3 Cyl. Auxiliary Engines Direct Connected D.C. Generators
Turning Gear
Motor Driven Circulating Pump
2,2000 I.H.P.-6 Cylinder Direct Reversing 4-Cycle Diesel Engines
Motor Driven Lubricating Oil Pumps
Steam Driven 2-Stage Air Compressor
4, Injection Air Bottles 1000 Lb. Pres. Per Sq. Inch
Motor Driven Fuel Oil Service Pump
Solar Oil Tank Cap. 1⅛ Tons
Thrust Bearing
2 Fuel Oil Daily Supply Tanks Cap. for 12 Hrs. Operation
Motor Driven Circulating Pump
4, Manuevering Air Tanks, Cap. 400 cu. ft. ea. 375 Lb. Pres. per sq. inch
Motor Driven Combined Bilge and Sanitary Pump
Motor Driven Ballast and Fire Pump
3 Stage Air Compressor for 375 Lb. Manuevering Air and 1000 Lb. Injection Air

Fig. 16.—Engine Room Arrangement of Twin Screw Motorship

are started in the engine room an hour or more before the time set for leaving the dock. The amount of attention given to the details of this preparation depends largely on how long the engines have been at rest. Assuming that the ship has been alongside the dock for several days, the first step is to turn each engine through a complete revolution with the turning gear, in order to see that everything is free and clear for running, after which the turning gear is disconnected. The lubricating oil circulating pump is then started and an inspection made to see that the oil circulates freely and reaches all of the bearings. If desired, this test of the lubricating system can be started while the engines are being turned. It serves a twofold purpose; it shows the condition of the system as to operativeness and at the same time fills all the bearings with oil and prevents starting the engine with dry bearings.

If the compression in the power cylinders is right and all other conditions normal, any Diesel engine should start readily when cold but this quick starting is assured and stresses in the cylinders and heads, due to a rapid change from the cold to the hot condition, can be avoided if a means is provided for heating up the cylinders and heads before starting. This can be done easily and the heat distributed very evenly, when steam is available, if a small steam line is tapped into the discharge line from the cooling water circulating pump and a by-pass, with valve, installed between the suction and discharge pipes of the pump, the connection to the discharge pipe being made at some point between the overboard discharge valve and the outlet from the engine cooling system. After the pump is started and the system filled with water the overboard discharge valve is closed, the sea suction valve closed and the by-pass valve opened. This makes the cooling system a closed circuit and the same water circulates repeatedly through the jackets and back to the pump. Now, if live steam is turned into the line through the small steam connection to the discharge pipe, the water in the system can be heated to any desired degree and the hot water, circulating through the jackets, heats the cylinders and heads. When the engine has been heated up in this way care must be exercised to see that the by-pass valve is closed and the suction and discharge valves opened after the engine is started.

This method of heating has the advantage of simplicity but it has the disadvantage that some fresh water will be lost. The steam that is used for heating is not recoverable. When feed water must be conserved, or where considerable heating of the engine before starting is always required, as in the case of some engines designed for operation with low compression, heating of the water with steam coils is preferable.

In order to insure prompt beginning of combustion when the engine is started and thus reduce the amount of starting air used it is essential that fuel oil discharge into the spray valves should begin as soon as the fuel pump plungers begin to move. There is a considerable length of discharge pipe between each fuel pump and the cylinder it supplies and this requires that the pipes be completely filled with oil up to the spray valves before starting. If a pipe is filled completely with incompressible oil, even a very small quantity of oil forced in at the pump end will cause the discharge of a like

Generated on 2024-09-12 12:18 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

amount at the spray valve end. The by-pass valve in each fuel line, near the spray valve, should be opened and oil pumped through the lines with the hand priming pumps until all air is forced out. The presence of air in the lines will be indicated by the bubbles in the oil flowing out of the by-passes and pumping should be continued until no more air bubbles appear. Some engines are equipped with an individual priming pump for each cylinder, while others have a single pump that forces oil into the suction chamber that

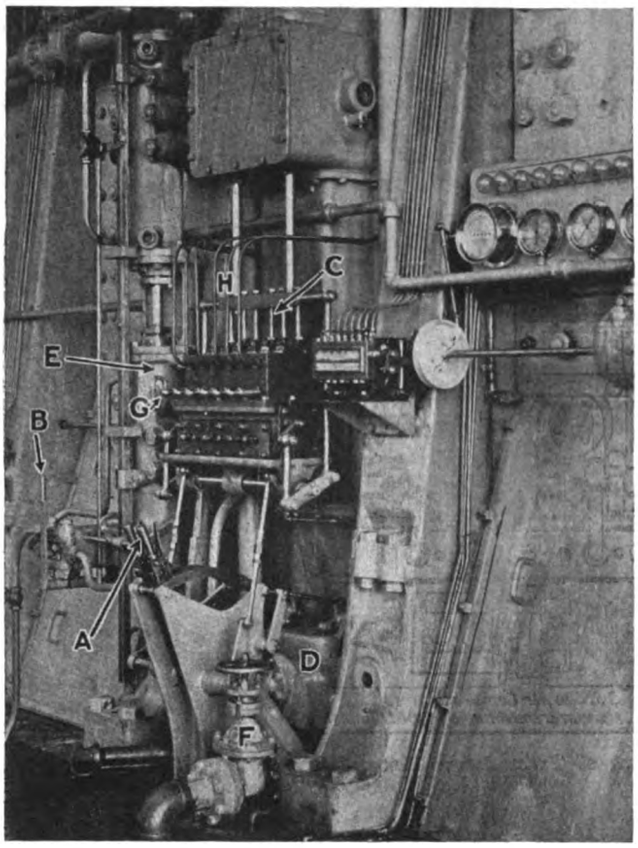


Fig. 17.—Controls on a Marine Diesel Engine

supplies the fuel measuring pumps, or into a discharge manifold, thus causing the oil to flow through all of the discharge pipes at the same time.

After all of the air has been forced out of the lines and only oil flows from the discharge, the by-passes are closed and the priming pumps given a stroke or two to force a little oil into the spray valves. Some judgment is required in doing this. If too much oil is pumped into the spray valves the first ignitions, after the engine begins to turn, will result in heavy explosions and produce excessive pressures in the cylinders.

The final steps in the preliminary preparations should include opening of the main stop valves in starting air lines, opening spray air compressor suction wide, closing compressor unloader, inspection of gages to see that air pressures are up to normal and fuel oil service tanks full, and, if the high pressure air lines to the spray valves are fitted with stop valves, they should be opened wide. Word should be sent to the mate to see that everything around the stern of the ship is clear of the propellers and all mooring lines secure. The last thing done should be to open the stop valve on the spray air bottle, admitting high pressure air to the spray valves. The engine crew should be clear of all moving parts of the engine when this is done. If a spray valve happens to be in the open position the air pressure in that cylinder may cause the engine to turn quickly through part of a revolution.

Fig. 17 shows a typical arrangement of the controls on a large marine engine. The two levers *A* control the air admission when starting and regulate the fuel oil supply when running. Hand lever *B* operates the reversing gear through the air operated reversing engine *E*. Six fuel pump plungers, one for each cylinder, are seen at *C*. The automatic piston valves *D* cut off the starting air when the two control levers reach the fuel admission position. The starting air supply from the storage tanks is cut out by the stop valve *F*. The hand priming pumps, one for each cylinder, are shown at *G* and the fuel oil discharge pipes leading to the spray valves at *H*.

Starting the Engines

In the case of a twin screw installation it is best to try out only one engine at a time but, if, in order to save time, it is desired to operate both engines at once, one should be run astern while the other is running ahead. This prevents putting too much stress on the mooring lines.

When the air controls are moved to the starting position the admission of enough air to give rapid acceleration of the pistons is an aid to prompt ignition of fuel but too rapid turning of the propeller will cause a dangerous surge on the moorings. This surge can be prevented, if the engine is turned rapidly at first, to get a quick start of combustion, then the fuel controls throttled down quickly to give the slowest speed at which the engine will run and fire regularly. The propeller power resulting from the quick start on air will be absorbed in slip and, if combustion begins promptly, the engine can be throttled down before the propeller has overcome the inertia of the ship and the slack in the mooring lines can be taken up very gently. The engine speed can then be gradually worked up as desired but normally there is no necessity for working up to full power for warming up. Operation at medium speed is continued long enough to warm up the engine and permit inspection of all the moving parts, especially the valve gear, to see that everything is working properly. It is best not to start the cooling water pump until after the engine is started, as the cold water may chill the cylinders enough to interfere with prompt ignition. It should, however, be started without delay after the engine is running, because the temperature of the cylinders will rise very rapidly when combustion starts.

After operating in one direction until everything is found to be in good order the engine should be reversed, to try out the reversing gear. Starting up in the reverse direction should be done very gently as all the slack in the moorings must be taken up again. If for any reason it is desired to make a number of reversals, it is advisable to have a deck officer stand by on the bridge to give engine signals, if necessary, to prevent accident to the ship. After the engines have been operated long enough to assure the engineer that everything is working properly the ready report is made and the engine crew stands by to maneuver the engines in accordance with signals from the bridge.

(To be continued)

S.S. GERALDINE MARY.—Vickers, Ltd., launched at Barrow-in-Furness on August 19 the single screw cargo steamer *Geraldine Mary*, which is being built for the Angle-Newfoundland Development Company. This vessel has been specially designed for the carriage of paper in rolls and the depth of holds and 'tween decks are arranged to give a minimum waste space. The vessel has a length between perpendiculars of 422 feet; a breadth, molded, of 56 feet; a depth, molded, to upper deck of 38 feet 6 inches; a load draft of 26 feet 6 inches; a deadweight capacity of about 9,000 tons and, with her triple expansion engines developing about 3,000 indicated horsepower, she will have a service speed of 11 knots. The forward end of the vessel is especially strengthened for ice breaking purposes.

Generated on 2024-09-12 12:06 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Water Rates and Steam Consumption of Auxiliaries—IV*

Auxiliaries of the Second Group—Steam for Galley, Pantry and Heating—Make-Up Feed Water—Total Steam Consumption

By E. A. Stevens, Jr.†, and H. E. Brelsford‡

As most of the auxiliaries of the second group are for supplying the necessities for the passengers and crew, their water rates or steam consumption cannot be based on the horsepower of the main machinery, except for a rough approximation, and then only when data are at hand of a similar ship carrying about the same number of persons per horsepower. To obtain an estimate of the steam used, calculations will have to be made for each auxiliary.

The examples given to illustrate how to obtain the steam consumption of each item are for a passenger ship carrying 205 first class passengers, 235 third class and a crew of 241 officers and men.

Steering Engine

It is useless to try to estimate accurately the average power required by this engine, unless automatic steering is employed, as so much depends upon the quartermaster, some using about four times as much helm as others. The shape of the after body and the trim have a great influence on the steering qualities of the ship. To add to the above difficulties very little is known about the steam consumption of steering engines. With the above in view one can see the futility of trying to make a detail calculation; however, an allowance should be made of the steam consumed, or the power required, if an electric steering gear is used. For making this allowance the following formulas are offered as a guide:

Steam per hour in pounds $= (0.1 \times \text{H.P.}) + 150$

or, if the ship is fitted with an electric steering gear:

Average kilowatts $= (0.00037 \times \text{H.P.}) + .6$

In both of the above formulas H.P. = the total indicated or shaft horsepower of the main unit or units.

Example

S.H.P. = 12,000.

The steam per hour $= (0.1 \times 12{,}000) + 150 = 1{,}350$ pounds, or, if the ship is fitted with an electric steering gear, the power used will be

K. W. $= (0.00037 \times 12{,}000) + 0.6 = 5.04$.

Sanitary Pump

This pump supplies salt water to the toilets, salt water baths and other purposes. The power required will depend upon the amount of water pumped per minute and the total head. The most accurate method of obtaining the weight of water handled is to estimate same from the piston displacement of this pump allowing about 15 percent for slip. As the double strokes of the pump are not always obtaintable the following formulas may be used for obtaining the average weight of water used per minute:

For first and second class passengers 0.45 pound per minute per person.

For third class passengers and crew the pounds of water per minute = (Number of persons $\times$ 3) + 200 pounds.

As a rule the sanitary system is arranged so that the quantity of salt water pumped for the crew and third class passengers is practically constant, no matter how many passengers are on board, and as the difference in the amount of salt water pumped for various numbers of first and second class passengers is not very large, it would seem best to take the maximum number of persons for all cases.

If the above allowances are used, no allowance need be made for the water used for the ice machine, and lubricating oil coolers, if their cooling water is supplied by this pump, as the amount of water given by the above will be sufficient to cover same.

The discharge head, which can best be obtained from gages placed at the pump discharge, is, as a rule, about 75 pounds for passenger ships and 25 pounds for cargo ships and tankers, and when no data are at hand these figures may be used.

The suction head will, as a rule, be positive as this pump is generally placed well below the water line, but as the suction piping is often long, with quite a number of bends, and as the strainers at the ship's side and at the pump suctions cause quite some resistance, a large part of this head will be used in overcoming this, and the resistance of the pump valves. Therefore, it seems best to take the discharge head as equal to the total head, unless this pump is near or above the water line, in which case the total head should be somewhat increased to allow for the friction in the suction piping and its fittings.

Example

Given a ship carrying the following:
205 first class passengers,
235 third class passengers,
241 crew.
Length of stroke of pump, 12 inches.

Find the amount of water pumped per minute and steam used per hour.

Water in pounds for
First and second class passengers $= 205 \times 0.45 = 92$.
Third class pasengers and crew $= (476 \times 3) + 200 = 1{,}628$.
Total water pumped 1,720.
Head $= 75$ pounds or $75 \times 2.25 = 169$ feet.

$$\text{Water horsepower} = \frac{1{,}720 \times 169}{33{,}000} = 8.80.$$

Mechanical efficiency from Fig. 6* = 0.773.

$$\text{Then I.H.P.} = \frac{8.80}{0.773} = 11.38.$$

Water rate from Fig. 6 = 170.
Then steam per hour $= 11.38 \times 170 = 1{,}935$ pounds.

Fresh Water and Drinking Water Pumps

The steam used by these pumps may be neglected as the amount is so small, being about 0.1 to 0.3 of one percent of the total steam used. However, if it is wished to make an allowance for these pumps, an average of 0.2 pound of steam per person per hour would fully cover this amount.

Dynamo Machine

The current generated by the dynamo is used for various items. On cargo ships it is generally used for lighting, operating electric fans in the living quarters and wireless apparatus. It is also occasionally used for heating, operating the ice machine and the steering engine telemotor, or the steering gear itself. On passenger ships it is used for lighting, wireless apparatus, operating electric fans in the living quarters and ventilating blowers. In most of the later ships electricity is used in the baking ovens and to a more or less extent for

* Copyright, 1924, by E. A. Stevens, Jr.

† Department of Maintenance and Repair, United States Shipping Board, Emergency Fleet Corporation, New York, and member of Fuel Conservation Committee, U. S. Shipping Board.

‡ Chief of Technical Section, Department of Maintenance and Repair, United States Shipping Board, Emergency Fleet Corporation, New York.

* See page 494, August, 1924, issue.

Generated on 2024-09-12 12:02 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

heating the living quarters. It is also used on some ships for operating the steering gear or its telemotor, forced draft blowers and the gyro compasses. The amount of electricity used on a ship can best be obtained from the ship's logs. For a new ship it can be obtained either by summing up the various requirements or by a comparison with a similar ship

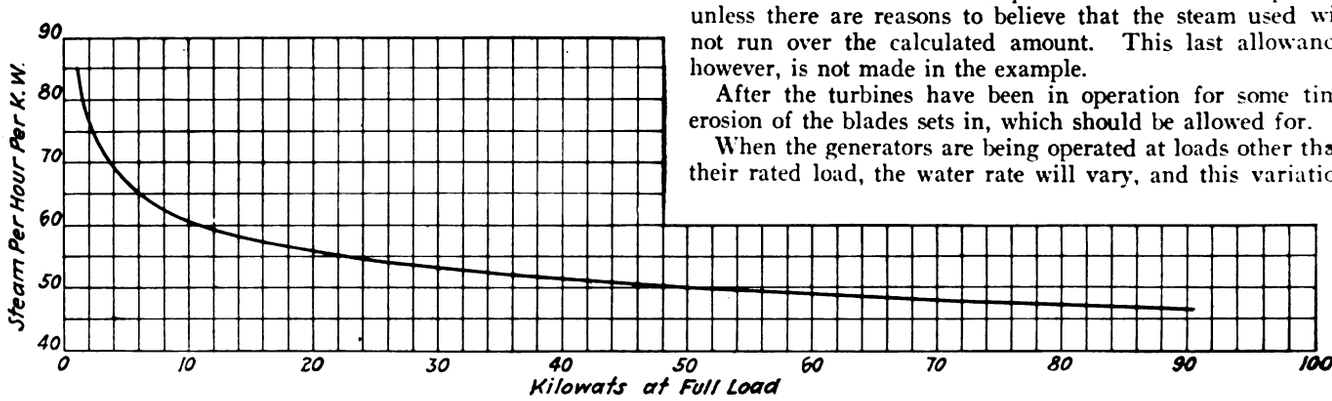


Fig. 11.—Water Rates of Reciprocating Engine-Driven Generators. Steam Pressure, 100 to 120 Pounds, Gage; Back Pressure, 10 to 15 Pounds, Gage

already in operation or it can readily be approximated with a fair degree of accuracy by the following formula:

$$\text{Kilowatts} = \frac{N}{C} + K.$$

N = Number of persons (passengers and crew)
C and K are constants, as follows:

For cargo ships and tankers, C = 10 and K = 2, when electricity is used for lighting and operating the fans in the living quarters. It will also include the power for the telemotor as this requires only a small amount. If the steering engine, ice machine, or blowers are operated by electric motors, the power required for these should be added.

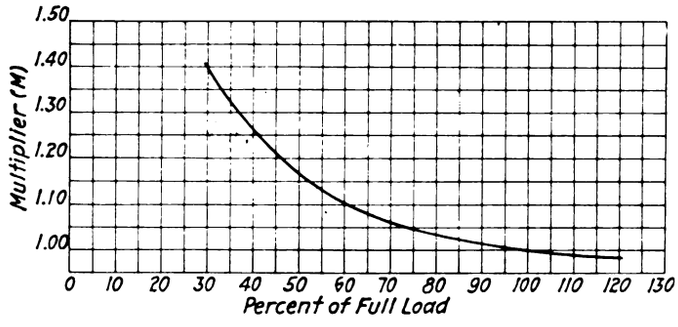


Fig. 12

For passenger ships K = 20, while C has various values, depending upon the extent that electricity is used.

When used for lighting and operating fans in living quarters, C = 10.

When used for lighting, operating fans in living quarters and ventilating blowers, C = 9.3.

When used for lighting, operating fans in living quarters and ventilating blowers, baking ovens and heating the living quarters, C = 8.5.

For average conditions take the number of persons on board equal to the sum of the whole crew and two-thirds of the maximum number of passengers of all classes.

If electricity is used to operate any of the auxiliaries, the power required should be calculated and added to the amount as found by the above formula.

Figs. 11 and 13 give the water rates of dynamo machines of various sizes, when operated at their rated loads. The curves of Fig. 13 are for well designed geared turbine outfits. If a direct connected turbine of good design is used, the water rate will be 15 percent greater. Unfortunately, there are a large number of turbines using considerably more steam than is shown by these curves, in some cases it being as much as 25 percent. To allow for this it would be advisable to increase the calculated steam consumption about 10 to 15 percent unless there are reasons to believe that the steam used will not run over the calculated amount. This last allowance, however, is not made in the example.

After the turbines have been in operation for some time erosion of the blades sets in, which should be allowed for.

When the generators are being operated at loads other than their rated load, the water rate will vary, and this variation is shown on Fig. 12 for reciprocating engine-driven generators and Fig. 14 for generators driven by either direct connected or geared turbines.

Example

Given a ship with a crew of 241 officers and men, and a maximum passenger capacity of 205 first class and 235 third class passengers. The generating plant consists of 4 geared turbine 50-kilowatt machines working at a pressure of 170 pounds and a back pressure of 10 pounds gage.

Find the average kilowatts required for lighting, operating fans in the living quarters, ventilating blowers, baking ovens and heating the living quarters, also the steam consumption.

Take N = Number of crew and two-thirds of the passengers.

N = 534, C = 8.5 and K = 20.

$$\text{K. W.} = \frac{534}{8.5} + 20 = 82.8.$$

If two units were in operation, this would be $\frac{82.8}{100} = 82.8$ percent of the full load. From Fig. 14 we find the correction factor for 82.8 percent of full load to be 1.06.

From Fig. 13 we find the water rate of a 50 kilowatt geared turbine outfit operating at 170 pounds pressure and 10 pounds back pressure to be 61 pounds.

The water rate corrected for this load will then be

$$1.06 \times 61 = 64.6 \text{ pounds.}$$

The steam consumption will then be

$$82.8 \times 64.6 = 5{,}350 \text{ pounds per hour.}$$

If the turbines are of poor design, the steam consumption should be increased.

If direct driven turbine units of the same number and capacity were used having the same steam and back pressure, the water rate at full load would be

$$1.15 \times 61 = 70.1$$

Correction factor for fractional load would be the same as before, namely 1.06, then the water rate at 82.8 percent of full load would be

$$70.1 \times 1.06 = 74.3 \text{ pounds.}$$

The steam consumption would be

$$82.8 \times 74.3 = 6{,}150 \text{ pounds per hour.}$$

If the turbines are of poor design, the steam consumption should be increased.

If reciprocating engines were used, the correction factor from Fig. 12 for 82.8 percent of full load is 1.027 and the water rate at full load from Fig. 11 (for a 50 kilowatt outfit) is 50 pounds.

Corrected water rate = $1.027 \times 50 = 51.4$ pounds.

Steam consumption = $82.8 \times 51.4 = 4{,}260$ pounds per hour.

If any of the auxiliaries other than ventilating blowers are operated by electric motors, the power required for their operating should be calculated and added to the power as found by the above formula, and the steam consumption figured the same as explained.

Dynamo Condenser

If there should be a separate condenser for the dynamo

Generated on 2024-09-12 12:27 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

machines, the calculations for the steam consumed by the circulating and air pumps should be made in the same way as that for the auxiliary condenser air and circulating pumps.

Ice Machine

As the type of the machine and its auxiliaries, such as pumps, condenser, etc., has a strong influence on the steam consumption, which is also affected by various conditions, such as the temperature of the sea water, type and thickness of the insulation of the refrigerated rooms and the distance of these rooms from the machine, it is difficult to give an average value for the steam used, and for this reason no attempt will be made to give a rule or curves for large machines such as those used for cooling the refrigerated cargo spaces.

As the machines used for the refrigerated spaces for the ship's stores are much smaller than the ones mentioned above and as their steam consumption is not large when compared with the rest of the machinery, the curve shown on Fig. 15 may be used when the direct expansion system such as is installed on most cargo ships is used. When a brine system is used, the amount of steam consumed as shown on this figure should be increased by about 15 percent and another 15 percent should be added, if the cooling water is supplied by a special pump.

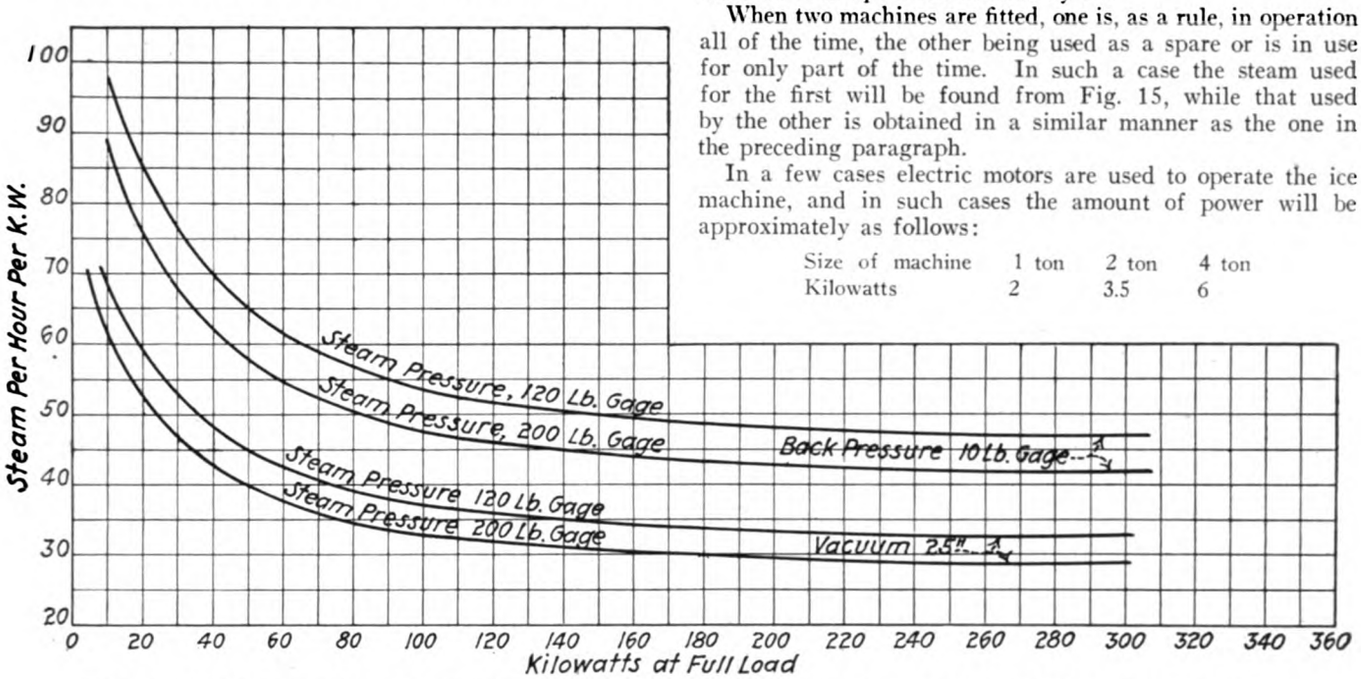


Fig. 13.—Water Rates of Geared Turbine Driven Generators. Add 15 Percent for Direct Connected Turbines

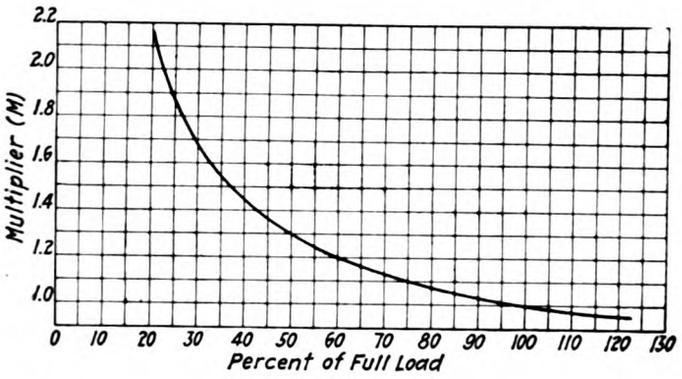


Fig. 14

The following rules are given for obtaining the average hourly consumptions:

When only one machine is fitted and is in operation for only part of the day, the average hourly steam consumption for the 24 hours will be the product of the steam consumption, as obtained from Fig. 15 and the number of hours the machine is in operation divided by 24.

When two machines are fitted, one is, as a rule, in operation all of the time, the other being used as a spare or is in use for only part of the time. In such a case the steam used for the first will be found from Fig. 15, while that used by the other is obtained in a similar manner as the one in the preceding paragraph.

In a few cases electric motors are used to operate the ice machine, and in such cases the amount of power will be approximately as follows:

Size of machine	1 ton	2 ton	4 ton
Kilowatts	2	3.5	6

Example

The ship is fitted with two 15-ton machines using the brine system.

The machines are fitted with independent circulating pumps and brine pumps. One machine is in constant operation, the other in operation for 8 hours during the day. Find the average hourly steam consumption.

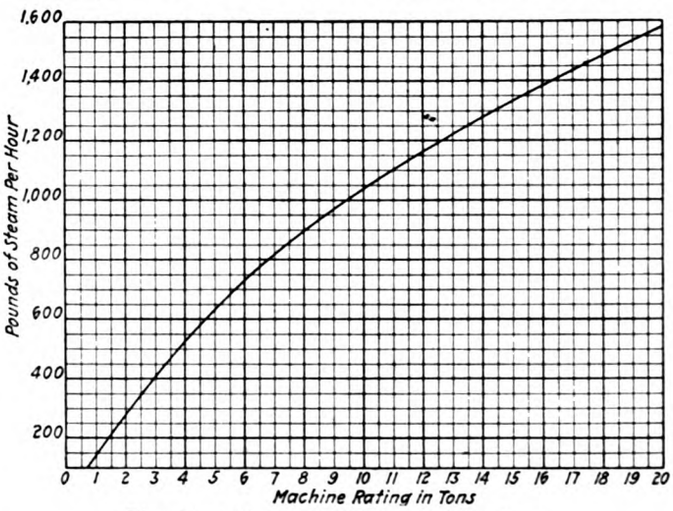


Fig. 15.—Water Rates of Ice Machines

Steam per hour from Fig. 15	1,330 pounds.
Add 15 percent for circulating pump	200 pounds.
Add 15 percent for brine pump	200 pounds.
Total	1,730 pounds.

This will be the steam used by each machine for each hour it is operated, therefore the average hourly consumption for the second machine will be $\frac{1,730 \times 8}{24} = 577$ pounds and the average hourly consumption will be $1,730 + 577 = 2,307$ pounds.

Generated on 2024-09-12 12:02 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Ballast

This pump is very seldom used in ordinary operation and, for this reason, the steam consumed by it is not a very important matter. When used to pump water ballast from one tank to another the head will be very low, consisting mostly of friction which will depend upon the speed at which the pump is operated, the length and diameter of the piping and the position of the tanks. When pumping water overboard the total head may be taken as 60 percent greater than the distance the overboard discharge is above the keel unless this discharge is under the water line where it should be taken as 60 percent greater than the draft. The mechanical efficiencies and water rates, under the above conditions or when pumping bilges in emergencies, should be taken from Fig. 10.*

Fire and Bilge Pump

About the only time that this pump is used, except in emergencies, is when washing decks and operating the ash ejector, which is only for a very short time during the day. In such cases, and when used as a fire pump, the discharge pressure may be taken at 75 pounds per square inch and the mechanical efficiency and water rate should be taken from Fig. 9.* When used as a bilge pump the total head may be taken at 60 percent greater than the distance the overboard discharge is above the keel except when this discharge is below the water line, in which case the total head may be taken 60 percent greater than the draft and the mechanical efficiency and water rate should be taken from Fig. 10.

Evaporators and Distillers

The steam used by the evaporators when operated in single effect can be calculated as follows:

$$W_s = \frac{W_w \times (h_2 - h_1)}{L}$$

W_s = Weight of steam in pounds.
W_w = Weight of water evaporated in pounds.
h_1 = Heat units in B.T.U. in one pound of water fed to evaporator.
h_2 = Heat units in B.T.U. in one pound of vapor at the pressure carried in the shell of the evaporator.
L = Latent heat of one pound of steam in B.T.U. at the pressure carried in the coils.

If there is more than one evaporator and they are operated in double effect, the amount of water evaporated by the second evaporator can be calculated as follows:

$$W_{w_2} = \frac{W_{w_1} \times L_1}{h_3 - h_1}$$

W_{w_2} = Weight of water evaporated in the second evaporator in pounds.
W_{w_1} = Weight of water evaporated in the first evaporator in pounds.
This can be found by transposing the first formula when the amount of steam used in the first evaporator is known.
L_1 = Latent heat of steam at the pressure carried in the shell of the first evaporator which pressure is approximately equal to that in the coils of second evaporator.
h_1 = Heat units in B.T.U. in one pound of water fed to evaporator.
h_3 = Heat units in B.T.U. in one pound of vapor at the pressure in the shell of the second evaporator.

As there are very few cases in the merchant service of evaporators being operated in double effect this problem will seldom be met with.

The maximum capacity to be expected should not exceed 20 pounds per square foot of heating surface per hour.

Auxiliary Condenser

This condenser is seldom used when the ship is under way, except when on trial trips where the steam consumption is being measured, but it is in continual use while the ship is in port, and if it is desired to estimate what the port consumption should be, it is necessary to obtain the steam used by its air and circulating pumps. In order to obtain the amount of steam being condensed by this condenser, two examples will be shown under the heading of "Steam Consumption While in Port." The vacuum in the auxiliary condenser seldom exceeds 15 inches, and when the condenser is placed rather high so the condensed steam will flow to the feed tank without the aid of the air pump, the pressure in the condenser will be about the same as that of the atmosphere.

This condenser is called upon at times to handle considerably more steam than the average, and in order to do so the air and circulating pumps are run at a higher load than what is necessary to handle the average amount of exhaust steam, so when estimating the steam consumption of the auxiliary air and circulating pumps, an addition of about 40 percent should be made to the steam necessary to operate these pumps under average conditions.

There are several different arrangements of the air and circulating pumps, but they may be classified in two main groups. The first is the combined air and circulating pump, where the steam cylinder is generally between the water and air cylinders and connected directly to them. The second is when the two are independent, in which case the circulating pump may be either a direct acting reciprocating pump or one of the centrifugal type.

As the auxiliary condenser is, as a rule, placed rather high, the head will be greater than that of the main condenser, but as the draft varies with the cargo on board, the total head varies, an average, however, may be taken at 30 feet.

Combined Auxiliary Air and Circulating Pump

After determining the amount of steam to be condensed and the vacuum, if any, to be carried, the necessary amount of circulating water and the water horsepower of the circulating cylinders can be determined by the same formulas as used for the main circulating pumps, except that the head will be different. The air horsepower may be obtained by letting the total head in feet equal the vacuum in inches +15 and multiplying this head by the weight of condensed steam handled per minute and divided by 33,000. The mechanical efficiency and water rates may be obtained from Fig. 10, the I.H.P. being the sum of the water horsepower of the circulating cylinder and the air horsepower of the air cylinder divided by the mechanical efficiency.

Independent Auxiliary Air Pump

If the vacuum is low, that is, less than 15 inches, the air horsepower can be obtained in the same manner as the air horsepower of the combined air and circulating pump, except the head should be increased by about 5 feet, as this pump is generally farther from the auxiliary condenser than the combined pump would be, the mechanical efficiency and water rates being taken from Fig. 10. If the vacuum should be as high as 24 inches, which seldom is the case, the I.H.P. and steam consumption should be estimated in the same way as that for the main air pump, using Fig. 7* for obtaining the water rate.

Independent Circulating Pump

If this pump is of the centrifugal type, the power and steam consumption are figured in the same manner as the main circulating pump, with these exceptions:

The head should be taken at 30 feet in place of 20 and the pump efficiencies should be as follows:

Type of drive	Pump efficiency
Reciprocating engine	60
Geared turbine	55
Direct connected turbine	50

* See page 549, September, 1924, issue.

* See page 547, September, 1924, issue.

Generated on 2024-09-12 12:04 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

If the circulating pump is a direct acting reciprocating pump, obtain the water horsepower in the same manner as that of the circulating cylinder of the combined air and circulating pump using the same head (30 feet) and obtain the values of mechanical efficiency and water rate from Fig. 9.

Summation of the Auxiliaries of the Second Group

To sum up the total steam used by the auxiliaries of the second group, when the ship is under way, we have the following:

	Pounds per hour
Steering engine	1,350
Sanitary pump	1,935
Fresh water and drinking water pumps	136
Dynamo machine (direct connected turbine)	6,150
Ice machine, one only in operation	1,730
Evaporators not in use	....
Total	11,301

For the same reasons as given in the "Summation of the Auxiliaries of the First Group," an addition of 10 percent

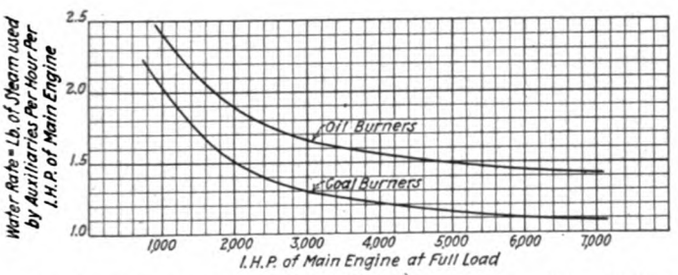


Fig. 16.—Water Rates of Auxiliaries on Cargo Ships Fitted with Reciprocating Engines. Data Are for Trial Trip Condition; For Sea Condition, Add 20 Percent

Auxiliaries driven by main engine: Main air pump, engine room bilge pump, sanitary pump. Independent auxiliaries: Main feed pump, fuel oil pump,* fuel oil transfer pump,* fuel oil heaters,* forced draft blowers,† main circulating pump,† dynamo engine,† ice machine,† steering engine. Make-up feed in pounds per hour = (0.4 × I.H.P.) + 600.

*Not included in coal burners.
†Driven by reciprocating engines.

for trial trip conditions and 15 to 20 percent for operating conditions should be made to the above, making the total as follows:

Trial trip condition 11,301 + 10 percent = 12,440 pounds per hour
Operating condition 11,301 + 15 to 20 percent = 13,000 to 13,560 pounds per hour.

Steam for Galley, Pantry and Heating

As the amount of steam used in the galley, pantry and for heating the living quarters and water for baths, etc., is not large, compared with that used for other purposes, it can be approximated with sufficient accuracy by the following allowances:

Steam used in pounds per hour per person:	
Galley and pantry	0.6
Heating water for baths, etc.	0.3
Heating living quarters	1.2

If the area of the radiators and the heating coils in the heating tables are known, the steam used by them can be obtained quite accurately by allowing 0.3 pound per hour per square foot of surface.

Example

Ship carrying 205 first class and 235 third class passengers and 241 crew. Steam used only in the galley and pantry and for heating water (living quarters are heated by electricity).
Steam per hour = 681 × 0.9 = 613.

Make-Up Feed Water

The quantity of make-up feed water can be determined only by experience, and then only approximately, as it varies considerably with the condition of the machinery and piping. The following formula is given as a guide when there are no data at hand:

Make-up feed in pounds per hour = (0.4 × H.P.) + 600.
H.P. = Total I.H.P. or S.H.P. of all shafts at full load. At reduced loads the make-up feed will be the same as at full load.

Example

Total S.H.P. = 12,000.
Make-up feed = (0.4 × 12,000) + 600 = 5,400 pounds per hour.

Total Steam Consumption

We are now in a position to make an estimate of the total steam consumption, which will be done for an oil burner under operating conditions, allowing 15 percent addition to the calculated steam consumption of the auxiliaries of the first and second groups. From this an estimate can be made of the fuel consumption.

Main turbines	132,000
Auxiliaries of Group 1	35,050
Auxiliaries of Group 2	13,000
Steam for galley, pantry, etc.	610
Total steam consumption	180,660
Make-up feed water	5,400
Total water evaporated	186,060

An evaporation of 13.5 pounds of water per pound of oil may be taken if the ship is fitted with efficient boilers and

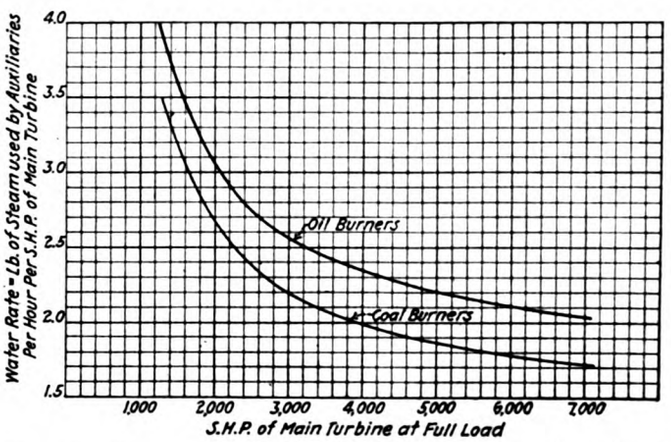


Fig. 17.—Water Rates of Auxiliaries on Cargo Ships Fitted with Geared Turbines. Data Are for Trial Trip Condition; For Sea Condition, Add 20 Percent

Auxiliaries: Main feed pump, fuel oil pump,* fuel oil transfer pump,* fuel oil heaters,* forced draft blowers,† air ejector or vacuum augmenter, condensate or air pump, main circulating pump,† lubricating oil pump, engine room bilge pump, sanitary pump, dynamo machine,† ice machine,† steering engine. Make-up feed water in pounds per hour = (0.4 × S.H.P.) + 600.

*Not included in coal burners.
†Driven by reciprocating engines.

burners and the operation is up to the standard. The fuel consumption per hour will, under these conditions, be 186,060 ÷ 13.5 = 13,780 pounds.

In order to obtain the total steam consumed at reduced loads, obtain the steam used by the main turbines at various loads, then calculate the steam used by the auxiliaries of the first group as explained at the end of "Calculations for the Steam Consumption of Each Auxiliary of the First Group." The steam used by the auxiliaries of the second group and that used by the galley, pantry, etc., will be the same for all loads of the main turbines.

Auxiliaries of Cargo Ships and Tankers

The steam consumed by the auxiliaries of cargo ships and tankers can be calculated by the same methods as just shown, but as the auxiliaries of various ships of this type do not differ as much as in passenger vessels, the water rate for all of the auxiliaries may be obtained quite accurately from the curves on Figs. 16 and 17, providing the auxiliaries are as designated on these figures.

Generated on 2024-09-12 12:27 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Should the forced (or induced) draft blower, the circulating pump and the dynamo, or any of these, be driven by turbines, calculate the steam required by the auxiliary when driven by a reciprocating engine and by a turbine and add the difference to the steam consumption as found by the product of the water rate and I.H.P. or S.H.P. as the case may be.

If any of the auxiliaries listed as independent are omitted or driven by the main unit, calculate the steam consumed by them as if fitted as independent and subtract this amount from the steam consumption, as found by the product of the water rate and I.H.P. or S.H.P.

If any of the auxiliaries listed as driven by the main engine should be independent, calculate the steam used by them and add same to the steam consumption as found by the product of the water rate and the I.H.P.

For reduced leads the water rates and steam consumption can be found by multiplying the water rates or steam consumption as found from Figs. 16 or 17 by the correction factors from Fig. 3*.

*See page 429, July, 1924, issue.

(*To be continued*)

Cracked Engine Column Welded

ON the first voyage of the S.S. *Knaresbro* en route to Cebu, P. I., a fracture was discovered in the high pressure back column. Speed was immediately reduced and upon arrival at Cebu the crack was welded electrically by the mechanical department of Hoa Hin Company, Inc., under the supervision of M. E. Cleland, manager. Fig. 1 shows the crack chipped out. Fig. 2 shows the crack and face studded with ¾, ⅝ and ½-inch studs, spaced 2-inch centers except at the crack where the studs were interlaced. The stud holes were drilled to a depth of ⅝-inch or approximately one-half the thickness of the column casting. Fig. 3 shows the completed weld.

After completion of the weld, the engine was turned up to 72 revolutions per minute (nominal speed being 60), when 2,500 indicated horsepower was developed.

Naval Architects to Meet in New York on November 13 and 14

THE thirty-second general meeting of the Society of Naval Architects and Marine Engineers will be held in the Engineering Societies Building, 29 West 39th street, New York, on Thursday and Friday, November 13 and 14. The professional sessions will begin at 10 A.M. each day.

Prior to the general meeting, the Council of the society will meet at 3 P.M. on November 12 in the Board room on the 15th floor of the Engineering Societies Building. Applications for membership should be received not later than November 12.

The annual banquet will be held in the Grand Ball Room of the Waldorf-Astoria Hotel, 34th street and Fifth avenue, New York City, on Friday evening, November 14, at 7:30 o'clock. Immediately preceding the banquet there will be a reception beginning at 7 o'clock. The total number at the banquet will be limited to 500.

The papers to be read at the professional sessions are as follows:

THURSDAY, NOVEMBER 13.

"Aeronautics in Naval Architecture." By Commander Jerome C. Hunsaker, C. C., U. S. N.

"Hydraulic Seagoing Hopper Dredges." By Captain W. D. Styer, U. S. A.

"Self-Unloading Bulk Cargo Vessels of the Great Lakes." By Henry Penton and Professor Herbert C. Sadler.

"Comparison of Model Propeller Experiments in Three Nations." By Rear Admiral David W. Taylor, C. C., U. S. N.

"The Extent of Cavitation in U. S. Scouts and Destroyers." By Captain Ernest F. Eggert, C. C., U. S. N.

"The Wake and Thrust Deduction of Self-Propelled Single Screw Models." By Professor Edward M. Bragg.

FRIDAY, NOVEMBER 14.

"The Design and Construction of Refrigerated Ships." By Lewellyn Williams.

"Application of Fuel Conservation and Engineering Performance Standards of Shipping Board Vessels." By Carl J. Jefferson.

"Scrapping Warships." By Commander Henry E. Rossell, C. C., U. S. N.

"Trials and Operation of Motorship Cubore." By Arthur B. Homer.

"Problems in connection with Conversion of the Hog Island Steamer *Seekonk* to a Motorship." By James C. Shaw.

"A Diesel Electric Tugboat." By Frank L. DuBosque.

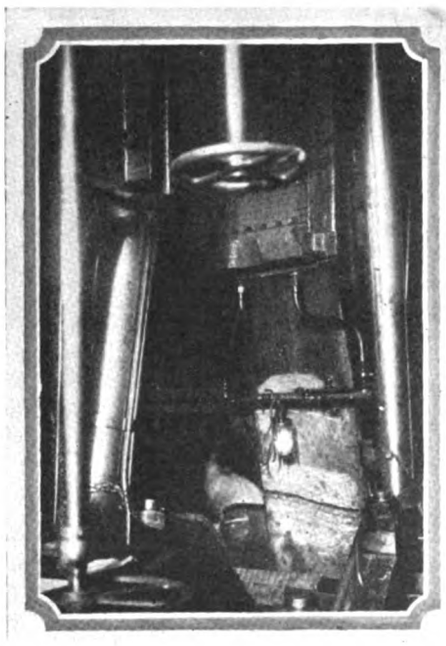


Fig. 1.—Crack Chipped Out

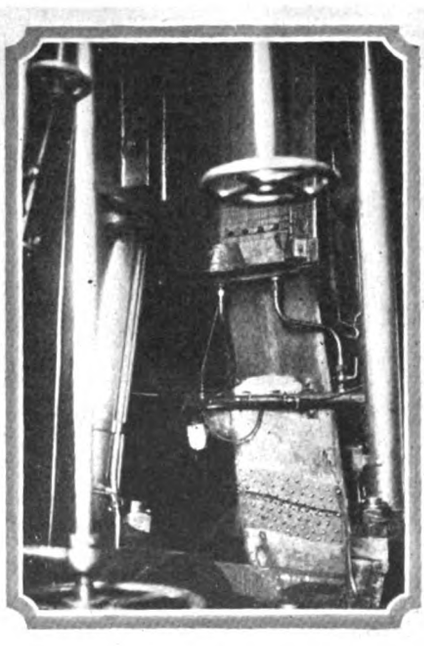


Fig. 2.—Studs Inserted

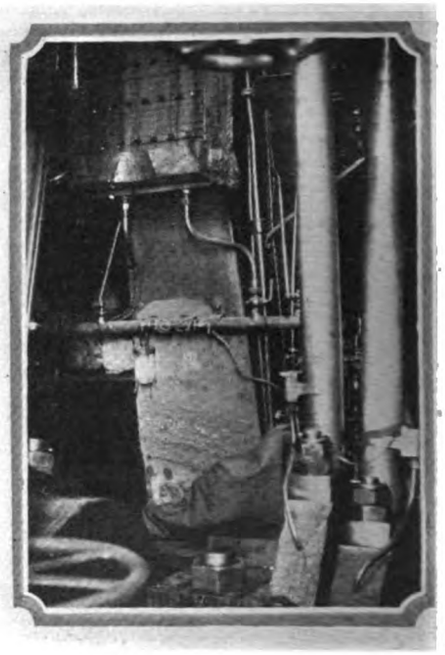


Fig. 3.—The Complete Weld

Generated on 2024-09-12 12:04 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Electric Arc Welding Applied to Shipbuilding

Savings That Can Be Made by Using Electric Arc Welding Instead of Riveting in Various Construction and Repair Jobs

By A. G. Bissell*

IN ship construction and repair wherever two pieces of steel are to be united the union can be made by the use of the electric arc welding process cheaper, quicker and as strong as by any other method. The ease with which a steel deposit can be made to fuse into and unite steel members with little or no preliminary preparation makes this welding method of great assistance in the shipbuilding and repair yard.

The assembly of parts does not always progress without a hitch. There are times when an angle comes out of the shop that is either too short or too long. Fig. 1 shows the angle securing a bulkhead to a deck. This angle was too short,

* General engineering department, Westinghouse Electric and Manufacturing Company, East Pittsburgh, Pa.

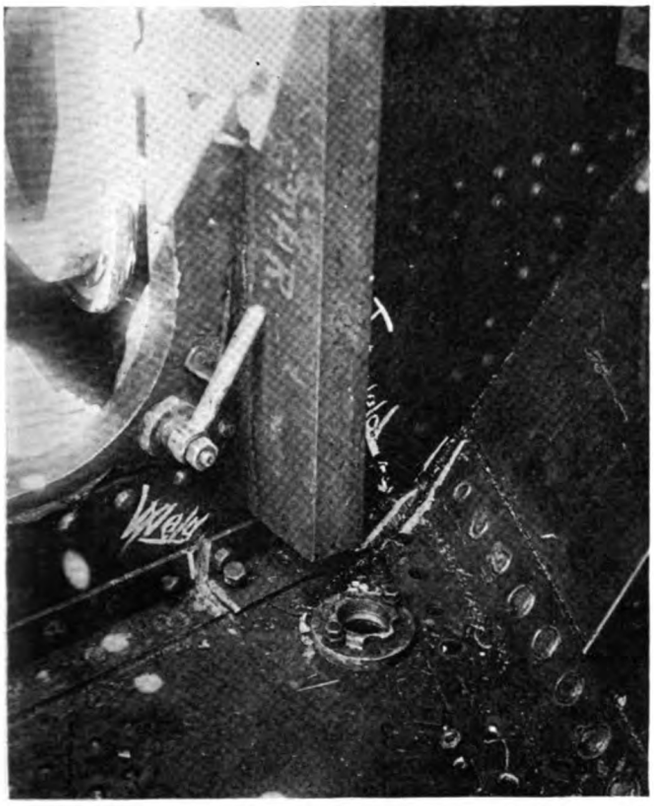


Fig. 1.—Work Prepared for Arc Welding to Extend Angle Bar and Make Watertight Corner Joint

Fig. 2.—Use of Arc Welding to Join Two Angles and to Eliminate Joggling of Angle

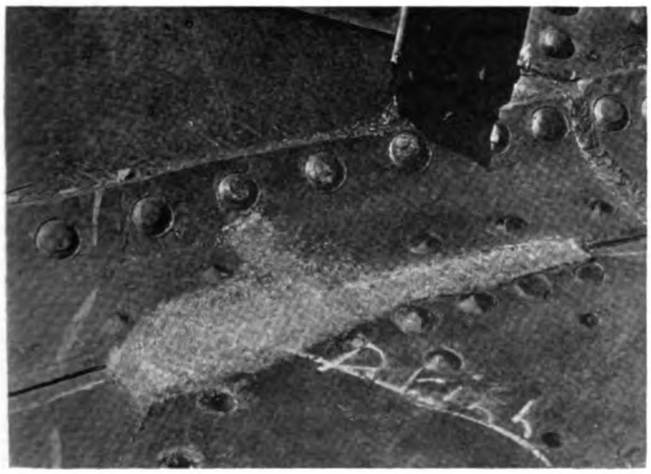


Fig. 3.—Similar Job as Shown in Fig. 2, Showing Work Partially Completed

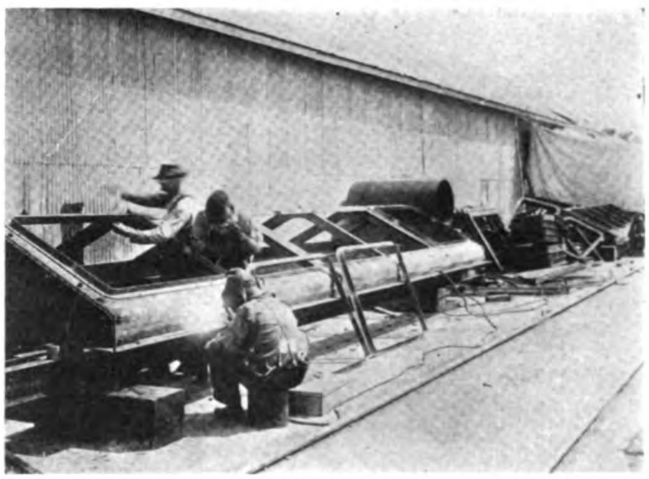


Fig. 4.—Arc Welder Assembling a Skylight

Generated on 2024-09-12 12:02 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

so a piece was cut to fit, set in place and prepared for arc welding. The pieces of angle are first riveted in place, then the joints indicated are united by the use of the electric arc.

Another place where the angle uniting the shell plate and a deck plate passes over a lap in the deck plate is shown in Fig. 2. In this case, to avoid joggling the angle, it is cut

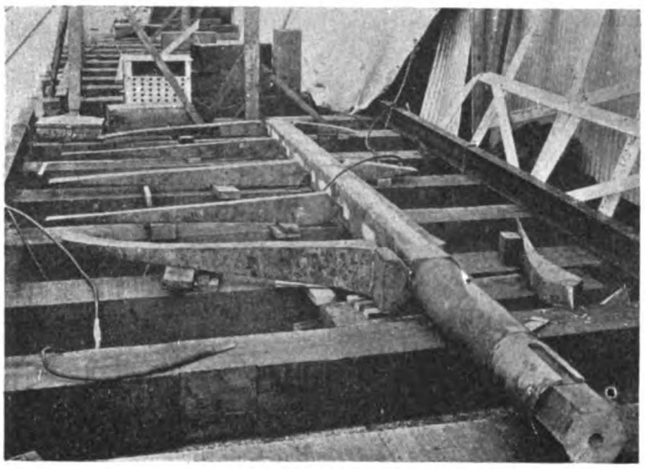


Fig. 5.—Rudder Frame Lined Up for Preliminary Tacking

as shown so that the edge can be drawn flush with the deck on both sides of the lap. The butt joint between the angles is also shown as prepared for welding. Fig. 3 shows a similar location after a part of the welding has been completed and finished by the chipper and calker. More welding is to be done at each end of the finished section indicated by the chalk marks.

Skylight Construction

The use of arc welding in place of riveting is well demonstrated in Fig. 4, which shows an engine room skylight in

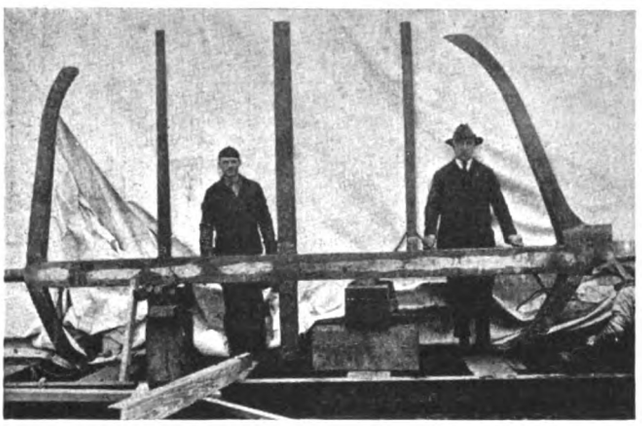


Fig. 6.—Completed Rudder Frame in Position in Which Welding Was Done

the course of construction. The structure in this case was completely bolted together by widely spaced bolts before welding. In welding these skylights they were well supported and perfectly lined up before welding. While welding it was found desirable to weld about a 6-inch seam then skip a foot or two and weld 6 inches more, in this way avoiding overheating the surrounding metal and warping the structure. It was found desirable to leave the bounding bar unwelded until after the skylight had been set in place on the ship in order that the angle might be made to conform to any irregularities in the deck. After this angle was secured to the deck, the fillet weld between the toe of the angle and the side of the skylight was made and the bolt holes filled. Where the skylight is not to be portable it is welded directly to the deck. Many changes may be made in the design of these skylights, eliminating the angles and substituting flat bars.

In the construction of funnels, arc welding can be used and the necessity of punching, reaming and riveting eliminated. By assembling the funnel on a rack the necessity of bolting can be avoided. The omission of laps gives a smooth job with a slight reduction in weight. Funnels made by this method will remain smoke and gas tight and have a much better appearance than riveted funnels. Smoke uptakes also may be assembled by arc welding.

Built-up Rudder Frames

The use of arc welding in uniting heavy steel members is very successful, if it is properly done. In the construction of six built-up rudder frames the process was used with great success. Some difficulties were encountered before the

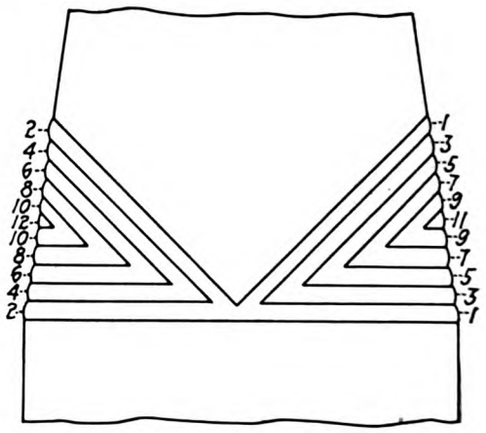


Fig. 7.—Diagram Showing Method of Depositing Layers of Weld Metal in Welding Rudder Frames

correct procedure was established but when these were overcome a very good job resulted. The methods of welding adopted in the construction of these rudder frames may be applied to any welding where more than one layer of deposited metal is required.

These rudder frames consisted of a stock 20 feet 1 inch long and eight arms ranging from 1 foot 11 inches to 5 feet 9 inches long. These parts were forged from medium steel. The arms were beveled at the ends to form a 45-degree angle on each side with the rudder stock and the bearing surfaces on the stock were all machined before the arms were attached.

The parts were prepared for welding by first removing all scale and dirt from the surfaces to be united. This was quickly done with a roughing tool and a pneumatic hammer. The parts were then lined up on a rack as shown in Fig. 5. While in this position the arms were temporarily secured to the stock by means of metal straps welded to the arms and stock. When this was done the whole structure was picked up by a crane and placed in the position shown in Fig. 6 to give the welder access to both sides of the cut. When the arms on one side of the frame were completely welded, the frame was turned over and the arms on the other side were completed.

It was found that to obtain the best results on this class of heavy welding it was necessary to deposit the weld metal in rows of beads to form a layer of metal on the surfaces to be united. A layer was deposited on one side then one was deposited on the other. Each layer was well peened with a pneumatic hammer before the next was applied. Fig. 7 shows diagrammatically the method of doing this welding.

Generated on 2024-09-12 12:03 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

By this method the peening stretches the deposited metal, removing the cooling strains while the heat of the fusion of the next layer removes the effect of the cold working and to a slight extent anneals the metal.

Savings Effected

In the welding of these rudder frames an average of

Fig. 8.—Completed Rudder in Place on Tug Just Before Launching

200 pounds of electrode metal was used on each one and twenty-five man-days were required to do the work. The cost of the completed rudders, one of which is shown in Fig. 8, averaged $1,950 each, of which $290 was for welding.

The saving in this cost of construction is evident when

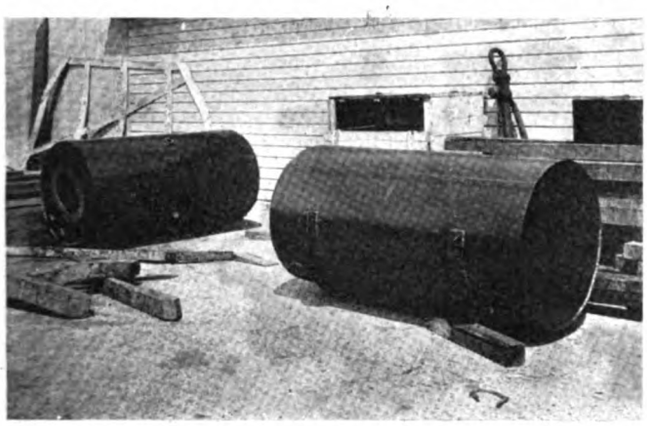


Fig. 9.—Arc Welded Tanks for Use on Board Ship

this cost is compared with the cost of a rudder having the arms forged on and the cost of a cast steel rudder.

Cost of rudder having arms arc welded to stock	$1,950
Cost of rudder having arms forged to stock	$2,247
Cost of cast steel rudder	$3,175

These figures were compiled in 1920.

Tank Work

Steel tanks of all kinds may be assembled by arc welding. These tanks are superior to riveted tanks in that they are lighter and stronger for a given thickness of plate. The recent tests on non-fired welded pressure vessels conducted at the Bureau of Standards has demonstrated that a properly conducted arc welded tank is equal to any other. Fig. 9 shows two tanks constructed by arc welding for ship use. These tanks were made by rolling the steel sheet into a cylinder having a joggled lap joint which was welded on both lapping ends. The splash plates, heads, manhole reinforcing ring and fitting were all arc welded. Where pipes were to be attached, a ¾-inch plate was welded to the head, then drilled and tapped to receive the pipe. This eliminated the use of packing, which would have been necessary had a flange been bolted on. Intricate shaped tanks may be assembled more easily by welding than by riveting, and all angles and in most cases all laps eliminated, giving

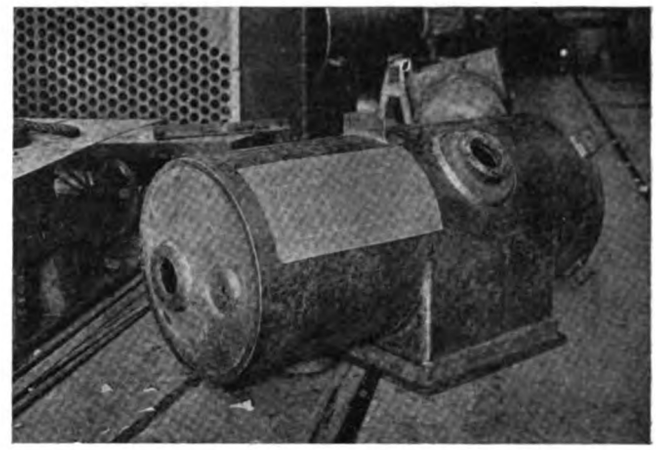


Fig. 10.—2,750-Gallon Arc Welded Evaporator

a reduction in weight which is a desirable feature in ship construction.

The saving in labor and material by the use of the arc welding process is evident in the construction of several sea water evaporators by arc welding and by riveting. These evaporators were of 2,750 gallons capacity and were all to

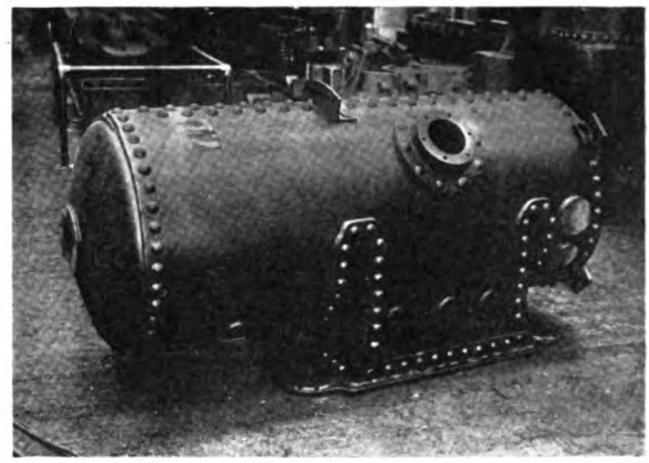


Fig. 11.—2,750-Gallon Riveted Evaporator

be used for the same service. The shells and tops of these evaporators were made of 7/16-inch steel and the bottoms of ⅞-inch steel. In those that were riveted two hundred and eighty-eight ⅞-inch rivets were driven. Flanging and lapping were eliminated in the welded evaporators resulting in a reduction of 330 pounds in the weight. In comparing the cost of labor required to build these evaporators, the arc welded evaporators cost 35 percent less than the riveted evaporator. Figs. 10 and 11 show an evaporator of each type.

Weight of riveted evaporator	1,630 pounds
Weight of welded evaporator	1,300 pounds
Difference	330 pounds
Direct labor cost, riveted evaporator	$191.43
Direct labor cost, welded evaporator	124.65
Difference	$66.78

Generated on 2024-09-12 12:25 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Bilge Keels

The installation of bilge keels has been very successfully accomplished by electric arc welding. By using this method there is an enormous saving in time and material over riveting. In riveting it is necessary to secure two angles or a "T" bar to the shell of the ship to hold the keel plate. This requires the punching of these angles and the plate in the shop. Where the angles pass over a lap in the ship plating, they must be joggled or liners inserted. For every rivet driven through the shell a hole must be drilled and the rivet calked. Every tank that is pierced must be tested after the job is completed.

In attaching a bilge keel by arc welding, the line is located on the bilge of the ship and the plate metal scaled and cleaned of dirt and rust for about 3 inches each side of the line. Supports to hold the keel plate in position for welding are attached every 8 to 12 feet depending upon the length of the section of keel to be supported. The supports are made of 2-inch by 4-inch timber and secured against the shell at ¼ inch below the centerline of the keel and braced from below by a second 2-inch by 4-inch. The keel plate of 20-pound steel prepared in the shop from templets is placed on the supports against the shell and secured by a spike. In case of irregularities or a lap in the shell plate, the keel plate is placed against the steel, a line scribed on it conforming to the contour of the shell, and the edge trimmed to fit with an acetylene torch. When the plate is secured in place tack welds are put in at one-foot intervals securing the keel plates on both sides to the shell. As soon as the tacks are made the supports are knocked out and a full fillet weld is put in, the work being done in two or three layers. The individual sections are joined with plain butt joints.

In this way a bilge keel can be installed without the use of angles or rivets; no shell plate is pierced and hence there are no tanks to be tested. On a ship requiring 344 feet of bilge keel on each side an installation was made in 9½ working days requiring 97⅝ welder man-days. One thousand three hundred and seventy-six linear feet of fillet weld and 41 feet of butt welds were made using 1,710 pounds of 5/32-inch welding wire. This job was done at a cost of $3,900 as compared with $8,000, the approximate cost of attaching a duplicate keel by riveting.

Repairs to Spanish Mail Steamship Reina Victoria-Eugenia

Messrs. Swan, Hunter & Wigham Richardson, Ltd., Wallsend, recently completed in a month's time extensive repairs to the Spanish mail steamship *Reina Victoria-Eugenia* in their No. 2 graving dock at Wallsend. This ship is owned by the Compania Transatlantica of Barcelona, and runs in their service to Argentina. She recently suffered collision in Buenos Ayres, a number of frames and shell plates on the port side being bent, and the forward port propeller carried away.

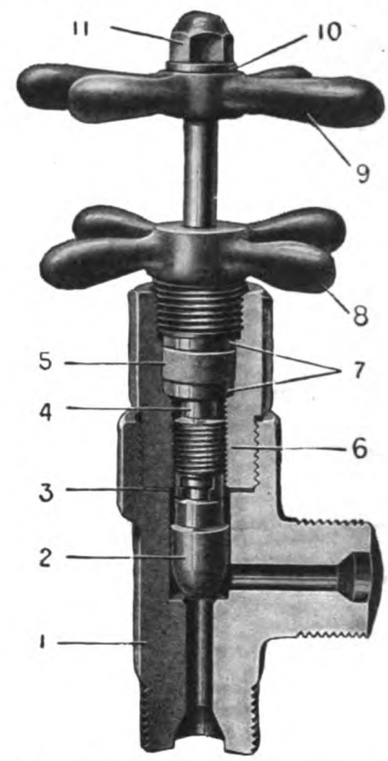
The work, which included putting the vessel through her No. 3 survey, and reconditioning the hull and engines, was entrusted to Messrs. Swan, Hunter & Wigham Richardson, Ltd., who built and engined the ship at their Neptune Works, Newcastle-on-Tyne, about twelve years ago. The reconditioning included repolishing most of the woodwork in the first class public rooms and repainting them. Furthermore, the whole of the telephone and electric lighting installations have been overhauled.

The propelling machinery of the *Reina Victoria-Eugenia* is a combination of reciprocating engines and turbines designed to effect economy in coal consumption. The two inner propellers aft are each driven by a set of four-crank triple expansion reciprocating engines balanced on the Yarrow, Schlick and Tweedy system. These engines exhaust into two low pressure Parsons turbines driving the two forward propellers. During the reconditioning of the vessel the turbines were opened for the first time since their original installation, and were found to be in perfectly good order.

The *Reina Victoria-Eugenia* is of 10,000 gross tons with a speed of 18½ knots. She is 500 feet in length with a breadth of 61 feet. She carries over 2,000 passengers, namely, 250 first class, 100 second class and about 1,800 third class passengers and emigrants. All the cabin accommodation is extremely well ventilated as the ship trades in tropical seas.

New Gas-tight Valve for Oxygen Manifolds

The Oxweld Acetylene Company, New York, after considerable study of different designs, has developed a high pressure valve to meet the rigid requirements for oxygen manifolds. This valve has a swivel tip on the stem and the detail given in the cross section illustration brings



Section of High Pressure Gas-Tight Valve

out the construction and operation to good advantage. The body (1) has a formed seat receiving the stem tip (2). This tip is attached to and carried by the stem (4) by means of a swivel joint. Thus the tip is enabled to seek its own natural seat in the body. The stem screw is in the inner end of the stuffing box (6) which is made gas tight into the body by means of the lead gasket (3). The stem itself is made gas tight by the rubber packing (5) which is pressed between packing rings (7) by means of a hand wheel and nut (8).

It is claimed that this new valve is fool proof and, even if the operator should happen to unscrew the hand wheel all the way, there is no possibility of the internal parts being blown out by pressure because the stem screws into the stuffing box. Should he unscrew both the stem and the hand wheel, the parts could not come out because the large nut of the stem would lodge against the inner end of the stuffing box.

Generated on 2024-09-12 12:05 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Questions and Answers Relating to Naval Architecture and Marine Engineering

Conducted by James L. Bates, Naval Architect, and W. B. Newton, Marine Engineer

This department is maintained for the purpose of answering all questions relating to ships and their machinery. All inquiries should bear the name and address of the writer. Anonymous communications will not be considered. The identity of the writer, however, will not be disclosed unless the editor is given permission to do so.

Attachment of Steel Sheathing

Q. (1,265).—A steel deck house is to be fitted with angle stiffeners, and is to be sheathed with No. 24 steel plating. What is the best manner to attach steel sheathing?

A. (1,265).—The light steel ceiling may be attached with screws tapped into a small 1¼ by 1¼-inch angle which is usually electrically welded to the standing flange of the angle stiffener. A less expensive method is to bolt a wood fairing piece against the standing flange of the angle stiffener and to fasten the metal ceiling to this by means of screws.

Monel Metal

Q. (1,276).—I would like to get some information regarding Monel metal which I do not find in the available handbooks. I would like the information necessary, from the designer's standpoint, to be able intelligently to incorporate this metal in the designs of various mechanism, in the form of castings, forgings, plates, rods, etc., the information to cover such points as—

How does it flow in the mold?
How does the heat of forging affect plates and bars?
How do the plates stand flanging, punching, etc.?
How are rivets handled, hot or cold?
How about welding and brazing?
What uses and machine parts is it best adapted to?

A. (1,276).—*Sources of Information.* The following data are taken principally from published statements by the International Nickel Company, New York.

Composition. Technically, Monel metal is an alloy of nickel and copper, containing about 67 percent nickel, 28 percent of copper and 5 percent of other elements. This remaining 5 percent consists partly of iron from the original ore and partly of manganese, silicon and carbon introduced in the process of refining. It contains no zinc or aluminum.

Monel metal is non-corrodible, tough and ductile. It can be machined, forged, soldered, and welded, both electrically and by the oxy-acetylene process. As a resistant to acids, it is superior to the usual metals sold for this purpose, not alone due to its non-corrodibility but because it is an alloy having great strength in addition to the characteristics of such metals.

Physical Properties:

Melting point	1,360 degrees C. (2,480 degrees F.)
Specific gravity (cast)	8.87
Weight per cubic inch (cast)	0.319 pound
Weight per cubic inch (rolled)	0.323 pound
Coefficient of expansion (20 degrees C.–100 degrees C.)	0.00001375 per 1 degree C.
Electrical resistivity, 256 ohms per mil foot (temperature coefficient)	0.0011 per 1 degree C.
Electrical conductivity	4 percent (Copper 100 percent)
Heat conductivity	1/15 that of copper
Shrinkage	¼ inch per foot
Hardness, cast material	20-23 (Shore scleroscope)
Hardness, hot rolled rods	27 (average Shore scleroscope)
Hardness, hot rolled rods	162 (average Brinnell)
Modulus of elasticity	22,000,000—23,000,000

Navy Department Specifications. For cast Monel metal, the chemical properties are to be as follows:

Copper, minimum	23 percent
Nickel, minimum	60 percent
Iron, maximum	3.5 percent
Aluminum, maximum	5 percent
Manganese, maximum	3.5 percent
Carbon and silicon combined, maximum	2 percent

Physical requirements are:

Minimum tensile strength in pounds per square inch	65,000
Minimum yield point, pounds per square inch	32,500
Minimum elongation in 2 inches	25 percent

For rolled Monel metal bars, plates, rods, sheets, etc., the chemical requirements are:

Copper, minimum	23 percent
Nickel, minimum	60 percent
Iron, maximum	3½ percent
Aluminum, maximum	5 percent
Manganese, maximum	3½ percent
Carbon and silicon combined, maximum	8 percent

For rods and bars the minimum yield point in pounds per square inch varies from 37,000 to 50,000. The minimum ultimate tensile strength in pounds per square inch, 75,000 to 85,000. The minimum elongation in 2 inches varies from 25 percent to 32 percent. For sheets and plates the minimum yield point in pounds per square inch is 30,000, the minimum tensile strength in pounds per square inch 65,000 and the minimum elongation in 2 inches, 15 percent.

Working Monel Metal. Rolled or drawn Monel metal and mild steel require about the same power to machine. Cast Monel metal requires somewhat more power.

Owing to the great toughness of the metal, tools with a keen edge are necessary in all machine work. These tools should be ground with a decided rake or lip, and only the better grades of high speed steel used. There have been recommended, by concerns using Monel metal, several high speed steels that have given satisfaction—to wit—Poldi (OOX-Extra), Rex A, Rex AA and Red Cut Superior. Stellite, a non-ferrous alloy, has also been recommended.

Directions for treating tools are furnished by the manufacturers and are followed to advantage.

Lubricants and cooling solutions are used by some, while others prefer to cut dry. For ordinary machine work Monel metal may be cut dry very satisfactorily. Some of the lubricants that have given satisfaction are as follows:

(1) Lard oil and 10 per cent turpentine (fine boring).
(2) Machine oil (general).
(3) Mineral lard oil, plus 300 test burning oil (threading).
(4) Lard oil—borax and aquadag (cutting off).
(5) Exanol (general).
(6) Oakite (milling).

Cutting speeds vary greatly from a slow speed of 8 feet per minute with heavy cut and feed, to a high speed of 250 feet per minute with light cut and feed. In the latter case a Stellite tool was used with machine oil for lubricant. A good average speed for general work would be from 50 to 60 feet per minute with 1/8 inch cut and 1/32 inch feed.

Forging. In forging Monel metal experience has shown that the following details should be observed:

First. The best forging temperature lies between 900 and 1,100 degrees C., and care should be taken not to exceed the latter temperature.

Second. In heating Monel metal a low sulphur fuel is necessary, preferably oil or gas, and care should be taken not to have the flame conditions either strongly oxidizing, or strongly reducing.

Third. Care should be taken to have the metal heated

Generated on 2024-09-12 12:04 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Generated on 2024-09-12 12:02 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google

BUREAU OF CONSTRUCTION AND REPAIR.

ESTIMATE OF COST, U. S. S. _____

DIVISION OF COST

Hull _____ $ _____

Machinery _____ _____

_____ _____

Total _____ $ _____

References: _____

_____

_____

_____

_____

N. C. R. 42.

No.	ITEMS.	Estimated Weight. *Pounds.*	Price per Lb. *Dolls.*	*Cts.*	Gross Value. *Dollars.*	*Cts.*	No.	REMARKS.
7	Ordinary steel in hull,							
	(*a*) Plating, outer and inner bottoms,							
	(*b*) Framing,							
	(*c*) Bulkheads,							
	(*d*) Decks,							
	(*e*) Bridges, hammock berthing, and cofferdams,							
	(*f*) Foundations for armor, turrets, and guns,							
	(*g*) Work around secondary battery, etc.,							
	(*h*) Foundations for machinery,							
	(*i*) Inclosures,							
	(*j*) Metal masts and spars,							
	(*k*) Rivets,							
	(*l*) Nonconducting sheathing and ceiling,							
	Total (7),						7	
8	Steel castings and forgings forming structural parts of hull, including stem, sternpost, struts, etc.,						8	
9	Special-treatment steel exclusive of armor supplied by the Government,						9	
10	Deck pillars or stanchions,						10	
11	Deck planking and wood in docking and bilge keels,						11	
12	Linoleum, tiling, etc.,						12	
13	Joiner work,						13	
14	Carpenter work,						14	
15	Wood ladders,						15	
16	Wood masts and spars,						16	
17	Metal ladders,						17	
18	Paint, cement, etc.,						18	
19	Turret-turning machinery, roller tracks, and rollers,						19	
20	Fixed ammunition-hoist machinery and gear,						20	
21	Rudder and steering gear,						21	
22	Cranes, davits, and other gear for handling boats,						22	
23	Coaling gear,						23	
24	Pumping and drainage, and sea connections,						24	
25	Plumbing work, including fresh and salt water systems, water-closets, baths, etc.,						25	
26	Ventilation,						26	
27	Anchor and cable gear,						27	
28	Warping and towing gear,						28	
29	Handrails and awning stanchions, canopy frames, and hatch cranes,						29	
30	Air ports, deck lights, and light boxes,						30	
31	Water-tight doors,						31	
32	Nonwater-tight doors,						32	
33	Manhole covers, scuttles, etc.,						33	
34	Miscellaneous hull fittings,						34	
35	Armor backing,						35	
36	Cellulose, and packing same,						36	
37	Fitting in place armor plates,						37	
38	Fitting in place armor bolts,						38	
39	Furniture and other construction outfits furnished by the contractors,						39	
40	Electric generating plant,						40	
41	Electric wiring and wireways throughout ship,						41	
42	Mechanical telegraphs, indicators, voice pipes, and other interior means of communication, under Bu. of C. & R.,						42	
43	Rigging and lines, canvas and bunting, and miscellaneous equipment, under Bu. of C. & R., furnished by contractors,						43	
44	Securing in place and installing Ordnance and Ordnance outfits furnished by the Government,						44	
45	Securing in place Construction and Repair outfits furnished by the Government,						45	
46	Securing in place equipment outfit, under Bu. C. & R. and S. & A., furnished by the Government,						46	
	Total of items 7 to 46,							
2	Drafting work: percentage of item at per cent of above,						2	
	Total,							
3	Laying down in mold loft,						3	
4	Preparation of slip, cribbing, and scaffolding,						4	
5	Preparation of launching ways and launching ship,						5	
6	Trial-trip expenses and docking,						6	
	Total of above items,							
1	General superintendence, office expense, insurance, freight: percentage of item at per cent of above,						1	
	Grand total value under contract,							

Compiled by _____ *Date* _____

Fig. 1.—Form Used by U. S. Navy Department as Basis for Schedules of Payment for Items Under the Bureau of Construction and Repair

Digitized by Google
Original from UNIVERSITY OF MICHIGAN

uniformly, which is best accomplished by repeatedly turning the ingot while in the furnace.

Fourth. The heat should be carried well past the point of work.

Fifth. If a forging of high strength is required, finish the forging at a temperature of 500-600 degrees C.

Welding. In the welding of Monel metal castings it is necessary to have a welding rod of the same material; likewise for the welding of rods or sheets, a welding rod of the same material being required in any case.

Monel metal may be welded by either the electric or oxy-acetylene process. Care should be taken to avoid overheating the metal while doing this work. Any experienced welder will find it easy to weld Monel metal after a few trials.

Castings. Castings are manufactured from metal supplied in the form of shot, ingots or blocks. These may be prepared for this purpose over oil or electrically fired furnaces. For the greater part, ordinary foundry practice may be adhered to, although slight variances in methods are necessary. Successful castings up to 25,000 pounds in a single piece have been made, some of them from intricate patterns.

Uses. In power plants Monel metal is used for valve seats, disks and stem, etc., for turbine blading and shrouding, for pump liners and for pump rods where coming in contact with high pressure self-heated steam.

In marine installations it is used for pump liners and rods, for propellers, both small and large, for propeller shafting and boat trim such as deck fittings, stern bushings, rudders, struts, stuffing boxes, etc., and for marine condenser parts, such as tubes and ferrules.

In gas and oil engines, for valves and ignition chambers, cables, wire cloth and other parts subjected to extremely high temperatures.

In chemical works, for tie rods, bolts, nuts, lag screws, pickling crates and frames, pump liners, rods and valves, where likely to be in contact with acid solutions at varying temperatures.

For mining equipment such as mine screens, coal chutes, pump liners, rods, etc., where in contact with alkaline water or solutions.

MISCELLANEOUS USES

Miscellaneous Uses. Storage battery casings, meat slicing machines, golf club heads, ornamental trim on buildings, mechanical conveyors, incinerator and sewage handling machinery, wire netting, skylight frames, laundry machine parts, refrigerating machinery, dairy machinery, etc.

The International Nickel Company, 67 Wall Street, New York, is in a position to supply such further detailed information as is available.

Percentage Completion of Vessels

Q. (1,270).—Referring to Q. (1,266) in the August, 1924, issue, in regard to the percentage of completion, your statement, excepting anchor handling gear, referred to hull only. What I wanted was, how is the percentage of the vessel's completion determined? For instance: The amount of time or work required for the house is greater than for the hull, when compared on a pound basis. Also, small parts of machinery, having little weight, often require more work than large castings, etc. What I wish to know is, how are these three elements which go into the making of a vessel, to be considered in computing the percentage of completion of a vessel as a whole? I would appreciate your replying at your earliest convenience.

A. (1,270).—The original answer to this question was merely intended to outline the principles followed in the Navy Department method of determining progress. The form shown in Fig. 1 is used as the basis for the schedules of payment for items under the Bureau of Construction and Repair. A somewhat similar form is used by the Bureau of Engineering for items under its cognizance. In making up the schedule for payments which forms the basis for progress reports, the total contract price of the vessel is first divided equitably between "Construction" and "Machinery." This division is usually fixed in accordance with prevailing costs per ton or horsepower or, if practicable, with the bids submitted upon the job in hand. The estimated weights in pounds for the various groupings under both construction and machinery are then entered in the appropriate columns. Next a cost per pound for each group is agreed upon between the Government and contractor, as stated in the previous answer, and entered in its column. In fixing this figure for a given group, the cost of the material, the character of the work, the time required both for manufacture and installation, the charge for labor and the indirect charges are all considered. The weight in each case is then multiplied by the cost per pound and the product entered as the gross value in the column so headed. The summation of the gross values of the various groups is then supplemented by the allowances for groups 1 to 6 inclusive (drafting, laying down, preparation of slip, etc.) to give the "Grand Total Value Under Contract." This latter figure is taken as 100 percent and each item in the column of "Gross Value" accounts for its proper percentage of the "Grand Total." As the work covered by each group progresses, the proper percentage of progress (based on the "Gross Value" of the work done) is recorded and payment made in accordance with the provisions of the contract.

As you suggest, there is much variation in the unit costs assigned the various groups. However, the writer is unable to substantiate your statement that the cost per pound of house is greater than that of hull. He has no cost data for tugs worked out in the elaborate form used by the department as this form is intended primarily for war vessels of more complicated structure. The following cost figures for a steel sea-going tug (dimensions 149 feet by 30 feet by 14.5 feet) having single screw, triple expansion engine and oil burning boilers may be of value to you. The weight groupings are summarized under the principal divisions so as to show their relative unit and total values.

	Weight in Pounds	Approx. Cost Per Pound in Cents	Total Cost
Main hull	797,950	11.5	$91,796
House	89,700	9.1	8,187
Hull miscellaneous	146,950	14.4	21,186
Hull engineering	162,180	35.2	35,935
Machinery	282,920	27.5	77,818
Boilers	287,550	18.1	51,864
	1,707,150		286,786
Outfit			6,900
Total yard cost			$293,686

The total yard cost given above does not include an allowance for overhead or profit. The above figures cover war-time conditions and are considered to have relative value only.

In comparing the unit cost for main hull and for house, note that the house is straight work, single riveted, weather tight, and uncalked. It is of relatively heavy plating, probably ⅔ that of the greater part of the hull plating. It results that in this case, at least, it is relatively inexpensive.

Correction

On the sketch accompanying A. (1,245), published in the June issue, the dimension L is drawn to the outside of the drum whereas it should be to the inside as, obviously, rope can be stowed only between the inner faces of the ends of the drum.

Attention to this error was pointed out by Mr. W. F. Schaphorst, M. E., in the August issue to whom due acknowledgment is made for his courtesy and also for the very concise and elegant formula he proposes.

Mr. Schaphorst's formula agrees very closely with formula C given in A. (1,245). The two formulas approach agreement as the diameter of the rope decreases.

Generated on 2024-09-12 12:02 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

NEW BOOKS

DIESEL AND OIL ENGINEERING HANDBOOK. By Julius Rosbloom. Second edition. Size, 7 by 5 inches. Pages, 780. Numerous illustrations, tables and charts. Los Angeles, Cal., 1924: The Technical Publishing Company.

This is the second edition of a book on the subject of oil engineering covering power production for land and marine service, a review for the first edition of which appeared on page 786 of the December, 1923, issue of MARINE ENGINEERING AND SHIPPING AGE. The present edition has been somewhat amplified, special attention having been given to the preparation of a chapter on oil production.

REPORT OF THE STATE ENGINEER AND SURVEYOR, NEW YORK. Compiled by Dwight B. La Du, State Engineer and Surveyor. Size, 8¾ by 6 inches. Pages, 371. Illustrated. Albany, N. Y. 1924.

The annual report of the State Engineer and Surveyor includes the expense statements for engineering work performed in New York state during the year 1923, tables of contracts completed and contracts pending as of December 31, 1923. The main part of the report is devoted to hydraulic work, principally the drainage of various river basins such as the St. Lawrence, Niagara, Genesee, Oswego, Black River and others.

SHIPS AND WAYS OF OTHER DAYS. By E. Keble Chatterton. Size, 8¼ by 6¼ inches. Pages, 308. Illustrated. Philadelphia, 1924: J. B. Lippincott Company.

This reprint of a book first published in 1913 is the story of the development of the shipbuilding craft from earliest times and of the progress man has made in his knowledge of the sea and in the handling of ships. An intimate picture is given of the life on board many types of sailing ships from the day of the Egyptians. The human side of the seafaring men of all ages is clearly portrayed by means of the thousand and one incidents that are on record showing life at sea in peace and in war.

THE SUPERVISION AND MAINTENANCE OF STEAM RAISING PLANT. By Charles A. Suckan. Size, 7⅛ by 9⅜ inches. Pages, 342. Illustrations, 250. London, 1924: Ernest Benn Limited.

A large amount of useful and varied information relative to the operation and maintenance of steam boilers will be found in this work. While mainly relating to stationary practice and referring only incidentally to marine work, the book contains much of interest to the marine engineer or any other concerned with the use of steam, although in a somewhat voluminous form.

It is primarily intended for the use of plant managers and engineers and to such should prove a useful guide to the intelligent management of steam generating apparatus.

HEATING AND VENTILATING ENGINEERS' GUIDE, 1924-1925. Size, 9 by 6 inches. Pages, 458. Illustrated. New York, 1924: American Society of Heating and Ventilating Engineers.

This third annual edition of The Guide of the American Society of Heating and Ventilating Engineers has been prepared in an effort to render a greater service to the science of heating and ventilating and to this end has been increased in size by the addition of many important technical subjects and by improving the character of the data contained. The book contains reference and design data useful in the planning and constructing of modern heating and ventilating installations, which have been prepared from the transactions of the society, from the investigations of its research laboratory and the practice of its members. A catalogue and reference data section is included in the book which supplies essential and reliable facts concerning modern equipment. In addition, the roll of membership of the society also appears. In the heating section of the book the code for testing low pressure heating boilers, pumps for heating and ventilating service, oil burning, and pipe sizes for water service lines are new features that have been included. In this section also appears new data on infiltration, capacities of steam heating risers and hot water heating. For the ventilation section, new chapters outline the present status of the science, giving facts about air washers, duct design, the Pitot tube and information on the comfort zone and effective temperatures.

ARC WELDING HANDBOOK. By C. J. Holslag, chief engineer, Electric Arc Cutting & Welding Company. Size, 4¾ by 7½ inches. Pages, 243. New York, 1924: McGraw Hill Book Company.

This book describes clearly and in detail the methods of arc welding so that the equipment and processes may be thoroughly understood and the newer applications of this branch of welding more generally recognized. It is a complete working manual for welding operators and those who supervise welding jobs and also an adequate reference guide for all concerned in any way with the use of arc welding. It describes the process of stubbing and holding an arc and points out clearly what should be done to get the best results. Different types of welding are treated completely. Starting with definite instructions as to the formation of beads, the author covers spreading welding, over-head welding, padding welding, fillet welding, lap welding, butt welding, etc. Specific applications of arc welding are included in specific sections. Definite directions are given in chapter 15, for instance, for the successful welding of cast iron and malleable iron. In chapter 16 the welding of thin cast-iron sections is covered. Other chapters describe the welding of all of the commonly used metals for many usual and unusual jobs. It is a plain and practical guide to its modern uses which will prove of material help to those interested in arc welding.

PERSONAL MENTION

LEONARD MITCHELL has been appointed director of the Press Aid Department of the United States Lines.

CAPTAIN WILLIAM D. R. GILBOY has been appointed port captain of the Shipping Board at San Francisco. Captain Gilboy was employed in a similar capacity at Seattle.

KENNETH J. BURNS, general manager of the Canadian Robert Dollar Company, has been appointed harbor commissioner and superintendent of the port of Vancouver.

E. P. ERCKENBRACK, district director of the Fleet Corporation at Seattle, Wash., has been appointed European director, succeeding Huntington Horse, resigned with office at London.

H. M. GALLAGHER, general manager of the Port Utilities Commission of Charleston, has tendered his resignation to become effective November 30, on account of ill health. Mr. Gallagher has been in charge of the property of the Port Utilities Commission since its acquisition two years ago. His successor will be named by the commission.

Generated on 2024-09-12 12:05 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

B. N. BROIDO, who has been doing special consulting work for The Superheater Company of New York and Chicago, has recently been appointed chief engineer of the industrial department of the company.

COL. ROBERT M. WATKINS, operating manager of the United States Shipping Board, has been transferred from the New York office to Seattle, Wash., as district director. Col. Watkins was born in Brooklyn, in April, 1879. At the time of the Spanish War he enlisted as a private in the regular army, and was discharged in 1903. Subsequently he was connected with the steamship and stevedoring industries in and about Puget Sound until the outbreak of the World War when he was commissioned as captain in the United States Engineers. In 1919 he was discharged from the army with the rank of colonel. During the war, he was in charge of all ship operations at the port of Marseilles, having opened and closed that port. Upon his return to the United States in 1919, he represented the Société de Traveaux Industries Maritime, a large French steamship and stevedoring concern. In September, 1921, he accepted the position as operating manager of the United States Shipping Board.

Col. Robert M. Watkins

LEWIS J. SPENCE has been elected executive officer of the Southern Pacific Steamship Lines, having risen from his first position in 1885 as stenographer in the office of Edward Hawley, general eastern agent of the Southern Pacific Company. In addition to his duties as director of traffic of all Southern Pacific system lines, including 11,000 miles of railroad, he will have general control and direction of all departments and operations of the steamship lines of the company and of all officers and employees engaged therein. Mr. Spence's mental alertness and power to initiate was quickly observed by Mr. Hawley and he soon received the appointment as Mr. Hawley's secretary. In three years Mr. Spence had risen to the position of chief clerk. This position gave him an opportunity to demonstrate his remarkable aptitude for directing transportation matters and his executive ability, combined with hard work, resulted in further recognition when he was made Eastern freight agent. In 1902, he was appointed general Eastern agent, succeeding the man who was first to recognize his ability. In 1906, Mr. Spence was made general freight agent of the water line, known as the Morgan Line. In January, 1911, he was appointed assistant director of traffic of the Southern Pacific and Union Pacific System, known then as the Harriman Lines, with headquarters in Chicago. Later in that year the headquarters were removed to New York and on January 1, 1912, he was elected director of traffic, succeeding J. C. Stubbs. Upon the dissolution of the Southern Pacific-Union Pacific merger in 1913, under an order of the Supreme Court, Mr. Spence was given the opportunity of remaining as director of traffic of either the Southern Pacific or the Union Pacific. He chose to remain with the company with which he began his railroad career. Mr. Spence is also a member of the board of directors of the Southern Pacific Company.

Lewis J. Spence

R. W. MORRELL has resigned as marine superintendent of the Tide Water Oil Company, New York, effective September 15, and has opened an office at Room 706, Munson Building, 67 Wall Street, as consulting naval architect, marine engineer and surveyor, specializing on tank steamer construction. Mr. Morrell graduated from Cornell University in 1909, with a degree of M. E., and began his marine career as an outside machinist with the Morse Drydock and Repair Company, Brooklyn. He went to sea as an oiler and cadet engineer with the American Line, afterwards spending five years with the Newport News Shipbuilding & Drydock Company as loftsman, ship fitter, draftsman, inspector and superintendent. While there he specialized in the building of tank ships. Mr. Morrell spent seven years with the Standard Oil Company of New Jersey as assistant marine superintendent and later as naval architect, having complete charge of the construction of 41 tank steamers, in sixteen different shipyards, including two 20,000 deadweight ton ships, the largest tankers in existence and the 20,000-ton combination oil and ore carriers, in addition to numerous oil barges of steel and wood and various small vessels. In this capacity he handled both hull and machinery work, designs, contracts, specifications, inspections, repairs, etc. For three years Mr. Morrell was with the Tide Water Oil Company as marine superintendent in charge of personnel, stores, maintenance, repairs and physical performance of the tank steamer fleet. He also had general supervision of the Tide Water Oil Company's lighterage equipment (owned by the East Jersey Railroad & Terminal Company) and designed and built several steel barges in addition to converting one of the company's tugs from coal to oil burning. While with the Tide Water and Standard Oil companies, he engaged in considerable consulting work, surveys, classifications, etc., and rendered expert testimony on steamer valuations. Mr. Morrell also served two years as director of the Carter-Weekes Stevedoring Company, New York; one year as chairman of the Technical Committee of the American Steamship Owners' Association. He is a member of the Society of Naval Architects and Marine Engineers and has written several papers on tank steamer construction and economy in ship repairs.

Robert W. Morrell

HON. WILLIAM STEDMAN GREENE, chairman of the House Committee on the Merchant Marine and Fisheries, died in Fall River, Mass., on September 22 as a result of a fall causing a fractured hip followed by pneumonia. Congressman Greene was 84 years old and had represented the Fall River district of Massachusetts in Congress continually since May 31, 1898. He was widely known for his efforts toward the upbuilding of American shipping.

Generated on 2024-09-12 12:04 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

The Month's Shipping and Shipbuilding News in Brief

Shipyard, Steamship and Port Activities and Other Notes of Interest in All Branches of the Marine Industries

Diesel Engine Building Shipyards to Submit Alternative Propositions on Shipping Board Conversions

SHIPYARD companies who are Diesel engine builders will have an opportunity to submit an alternative proposition on the installation as well as the construction of main engines and auxiliaries for the conversion of ships of the Shipping Board fleet to be Dieselized, according to an official announcement from Captain R. D. Gatewood at 45 Broadway, New York, on September 18. Captain Gatewood's statement follows:

"On representations made by a committee of the Atlantic Coast Shipbuilders' Association that a material saving might be possible, amounting perhaps to as much as 20 per cent in the total cost, by allowing a shipyard to bid on the total conversion job including main engines and auxiliaries and the installation thereof, it has been decided to allow those shipyards who are also Diesel engine builders to submit an alternative proposition on this basis. In order to permit them to do this it has been found necessary to delay the opening of the bids on the initial work of the Diesel engine program until noon, October 14th.

"In thus extending the time for opening bids it was clearly explained that the bid on the complete installation should be an alternative bid and the Government still desired to obtain bids on the engines proper, as per the original proposals, in addition to this alternative bid on the installation as a whole. It was further explained that the Government must reserve the right to withhold award on the bid for the installation as a whole until such time as it will be possible to obtain separate prices for the auxiliaries and the installation in accordance with the original program. Only in this way will it be possible to determine definitely the extent of the saving that might be found possible by considering the award on the basis of the installation as a whole.

"In order to be fair to the reliable and experienced firms and to obtain the advantages of their engineering experience and at the same time obtain for the Government the advantages of maximum competition, it is the desire of the Fleet Corporation officials to allow qualified engine builders to bid on engines, qualified auxiliary manufacturers to bid on auxiliaries, and qualified shipyards to bid on installation."

Contract Awarded for New Passenger Steamer

A CONTRACT for the construction of a hull for the new twin screw passenger steamer *Belle Island*, for service between New York City and Roton Point, Conn., has been awarded by Captain F. V. Drake to Harry A. Marvel, of Newburgh, New York. The steamer is to have a length of 211 feet on deck with a capacity of about 1,500 passengers.

Shipping Board Issues Specifications for Construction of Diesel Engines; Bids to Be Taken at New York, October 14

COMPLETE specifications for main oil engines for the conversion of a number of Shipping Board steamers into Diesel driven motorships, were issued on Thursday, September 4, and sealed bids for furnishing all or any part of twelve engines, are to be addressed to Captain R. D. Gatewood, manager of the Department of Maintenance and Repair, United States Shipping Board Emergency Fleet Corporation, 45 Broadway, New York. The bids are scheduled for opening at 12 o'clock noon, Eastern Standard Time, on October 14.

Type of Ships

Although the names of the ships to be converted have not been announced, the vessels selected are oil burning steel cargo ships of two types, design No. 1,013, built by the Los Angeles Shipbuilding and Drydock Company, and design No. 1,027, built by the Oscar Daniels Company. Design No. 1,013 is of 8,800 deadweight tons, having a length between perpendiculars of 410 feet 5½ inches, beam 54 feet, driven by one triple expansion 2,470 indicated horsepower engine, 28½ by 47 by 78 by 48, steam being supplied by three water tube boilers at 225 pounds pressure, having an approximate normal sea speed of 10.5 knots. Design No. 1,027 has a length between perpendiculars of 402 feet, beam 54 feet, driven by one triple expansion engine of 2,500 indicated horsepower, 24½ by 41½ by 72 by 48, steam being supplied by three water tube boilers, with a steam

Bath Iron Works Awarded Contract for Construction of Passenger and Freight Steamer for New England Steamship Co.

A CONTRACT for the construction of a passenger and freight steamer for the New England Steamship Company of New York, has been awarded the Bath Iron Works. The new vessel will be a duplicate of the steamer *Islander* recently completed by the same builders. It is understood that the cost will be over $300,000.

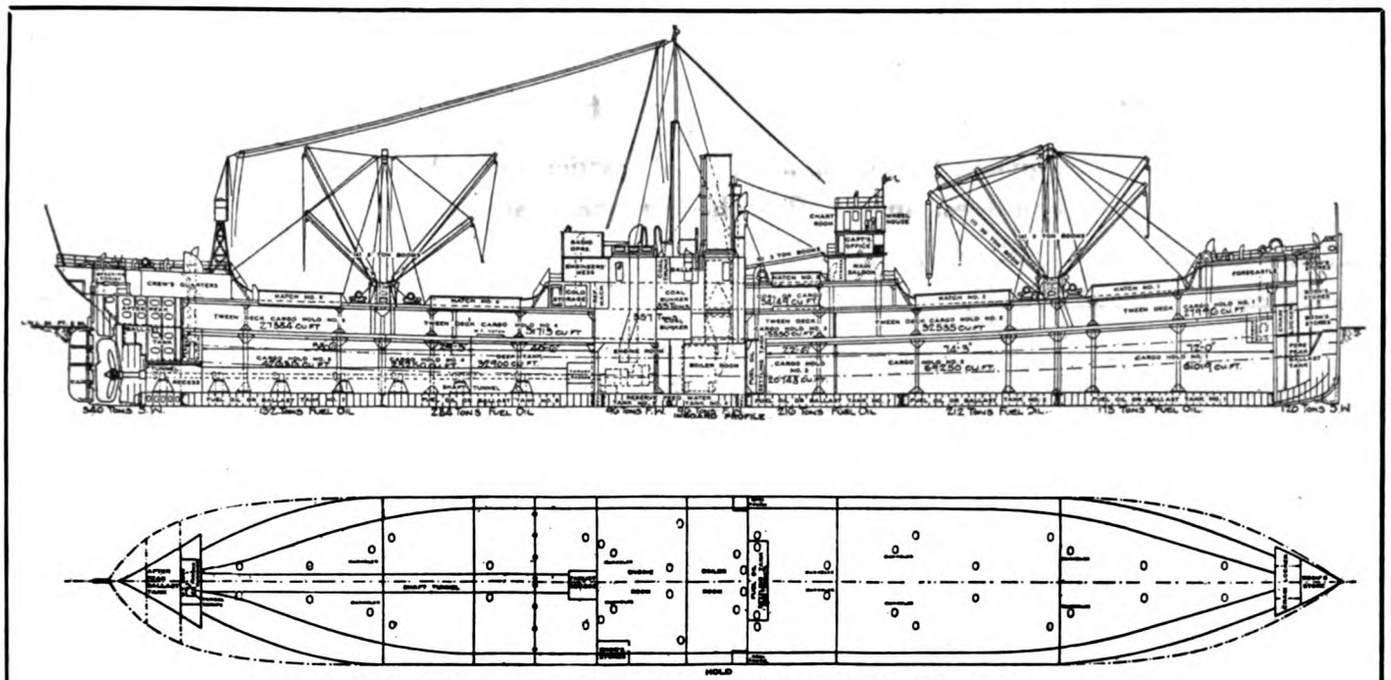
The new vessel will be constructed to replace the steamer *Sankaty*, which was burned at New Bedford on June 30. She will have a length between perpendiculars of 202 feet; beam 36 feet; depth 14 feet 3 inches, with a draft of 8 feet 11 inches.

Propulsion

Propulsion will be by a four-cylinder, triple expansion, steam engine, with cylinders 16-26-30-30 inches by a 24-inch stroke, steam being supplied by two Babcock & Wilcox boilers, at a pressure of 200 pounds. The engine will develop 1,300 horsepower, driving the vessel at a speed of 14 knots. Forced draft will be used and the steamer will be a coal burner.

Like the *Islander* the new vessel will have a capacity for carrying a total of close to 2,000 passengers in the summer season.

Generated on 2024-09-12 12:02 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN



Type of Ship (Government Design No. 1,013) Selected for Diesel Conversion

pressure of 200 pounds and a normal approximate sea speed of 10¼ knots.

Additional Engine Details

In addition to general details announced in the last issue, the specifications provide that the crank shafts for the engines may be of the built-up or head-forged type made in such a number of sections as the builder may desire in order to facilitate manufacture and handling on ship board. Wherever possible, sections shall be interchangeable. The pistons are to be of the latest design, water cooled, made of a special grade of cast iron developed by the contractor for this part of their engine and shall be of a uniform structure and slightly softer than the cylinder liner. The piston cooling system is to be of such design as to be suitable for each specific type of engine.

In the case of four-cycle engines the exhaust and air inlet valves are to be interchangeable throughout, arranged in removable cast iron cages having removable cast iron seats. All cages are to be arranged for water cooling and interchangeable. In the case of two-cycle engines they may be of the port or poppet valve scavenging type, having valves in the head. In the case of two-cycle the scavenging pumps should preferably be driven from the engine or they may be independently driven. In every case they are to be of ample capacity to properly scavenge working cylinders.

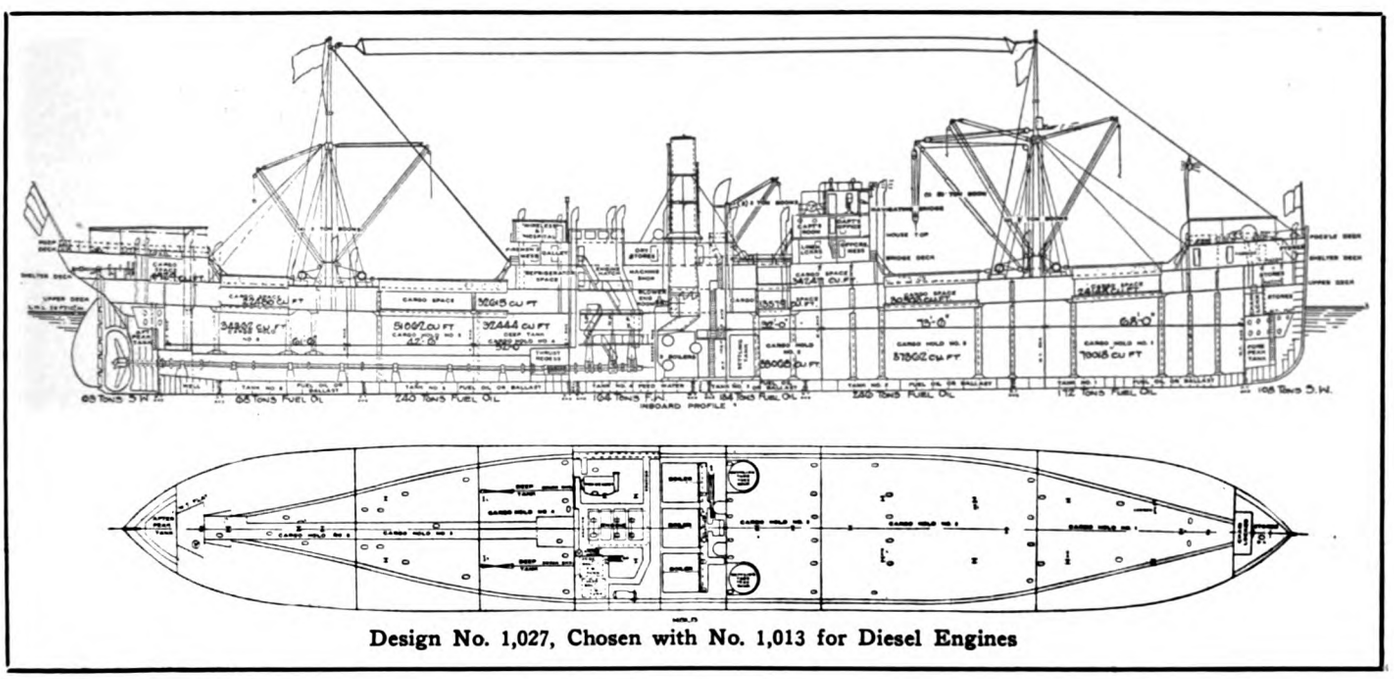
Wherever an injection air compressor is required for the functioning of the main engine it should preferably be driven direct from the main engine or it may be independently driven. It shall have not less than three stages and to be of ample capacity to supply the engine during the entire range of speed and loads.

The maneuvering gear shall preferably be located on the starboard side and shall be of an approved design and operated by hand levers, electrically, or both. This mechanism is to be so arranged as to be interlocked in such a manner so that the reversing gear cannot be moved while either the throttle lever or injection air is on the fuel valves.

The fuel pump is to be of the multiple plunger type having one plunger for each fuel valve.

Engine Contract

A contract for one pair of steamboat engines has been awarded by the United States Engineer Office, Pittsburgh, Pa., to T. M. Rees, Pittsburgh, at $13,650.



Design No. 1,027, Chosen with No. 1,013 for Diesel Engines

Generated on 2024-09-12 12:03 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Contemplated Construction

THE construction of a new passenger ship for Great Lakes service is anticipated in marine circles following the receipt of news of the destruction by fire of the steamer *South American*, of the Chicago, Duluth and Georgian Bay Transit Company. The *South American*, was a vessel of 2,662 gross tons, plying between Chicago and Buffalo, in conjunction with the steamer *North American*. The *South American* was burned at the wharf at Holland, Michigan, on September 8 and the loss is estimated at about a million and one-quarter dollars.

GOVERNMENT WORK

It is learned from official sources that the United States Engineers Department at Washington has at present under design a 20-inch hydraulic Diesel pipe-line dredge for the Philadelphia district; two small Diesel-electric towboats for the Kanawha and Ohio Rivers, respectively; a small direct Diesel-drive seagoing hopper dredge, and a hull for a steam towboat for the Rock Island, Illinois, district. It is expected that bids for this new equipment will be asked for in the near future.

600-Foot Freighter to be Built By the American Shipbuilding Company for Service on the Great Lakes

THE Pioneer Steamship Company and Hutchinson & Company have awarded a contract to the American Shipbuilding Company for a 600-foot freighter to be built at the Lorain yards and put into service next April. The vessel will duplicate the *R. V. Lindabury* and *J. A. Hatfield* of the Pittsburgh Steamship Company, turned out at Lorain last year.

The vessel will be of arch construction with side tanks 600 feet overall; 580 feet keel; beam 60 feet, and depth 32 feet. She will have triple expansion engines and Scotch boilers.

This is the second order booked for this class steamer for 1925 delivery, the other being for the Columbia Steamship Company by the Great Lakes Engineering Company at the River Rouge yards last March.

Bids October 21 for Five Steel Line Barges

Sealed proposals will be received by the Mississippi River Commission, 1st & 2nd Districts, 1006 McCall Building, Memphis, Tenn., until 11 A.M., October 21, 1924, and then opened, for furnishing five steel line barges.

Steel Ferryboat

Bids were scheduled for receipt on September 19 by the marine department of the New York Central Railroad for the construction of a double deck steel, screw propelled ferryboat, having an overall length of 210 feet. At the time of going to press the award of this contract had not been announced.

Specifications Under Way for Reconditioning Panama Steamer Ancon

THE biggest reconditioning job of the month is expected to develop in the proposed reconditioning of the steamship *Ancon* of the Panama Railroad Company, 24 State street. Specifications are being completed for the overhauling of the ship, including the installation of additional passenger accommodations and refrigeration. The *Ancon* is a vessel of 9,315 gross tons, in service between New York and Panama, and it is understood that the cost of the contemplated work will amount to several hundred thousand dollars.

It is proposed to increase the passenger carrying capacity of the ship from 40 to 250 persons and to install a refrigeration system for cargo space of approximately 30,000 cubic feet. Proposals for the work will probably be received in about three weeks.

Bids to Be Taken October 15 for Construction of Steel Hull, Steam Driven Snagboat for U. S. Engineers

SEALED proposals will be received by the United States Engineer Office, Montgomery, Ala., until 11 A. M., October 15, for the construction and delivery of one 156-foot steel hull steam driven stern-wheel snagboat. The vessel is to have a length, molded, of 156 feet; length overall, 178 feet; breadth, molded, 33 feet; breadth overall, 34 feet 1½ inches; depth at side, molded, 5 feet 6 inches. The boat is to be built to the American Bureau of Shipping rules and the longitudinal system of framing will be used. Steering will be accomplished by four rudders, the steering engine to be of approved size similar and equal to the Hyde Steam and Hand Steerers manufactured by the Hyde Windlass Company of Bath, Maine. The paddle wheel is to be of the radial paddle type, 18 feet in diameter over buckets, with 14 buckets 18 inches wide by 19 feet 10 inches long.

MACHINERY

The propelling engines are to be of the horizontal single-cylinder type, with the cranks on wheel shaft set at 90 degrees. They are to be designed for a working pressure of 200 pounds per square inch, the cylinders to be 14 inches in diameter with a stroke of 72 inches.

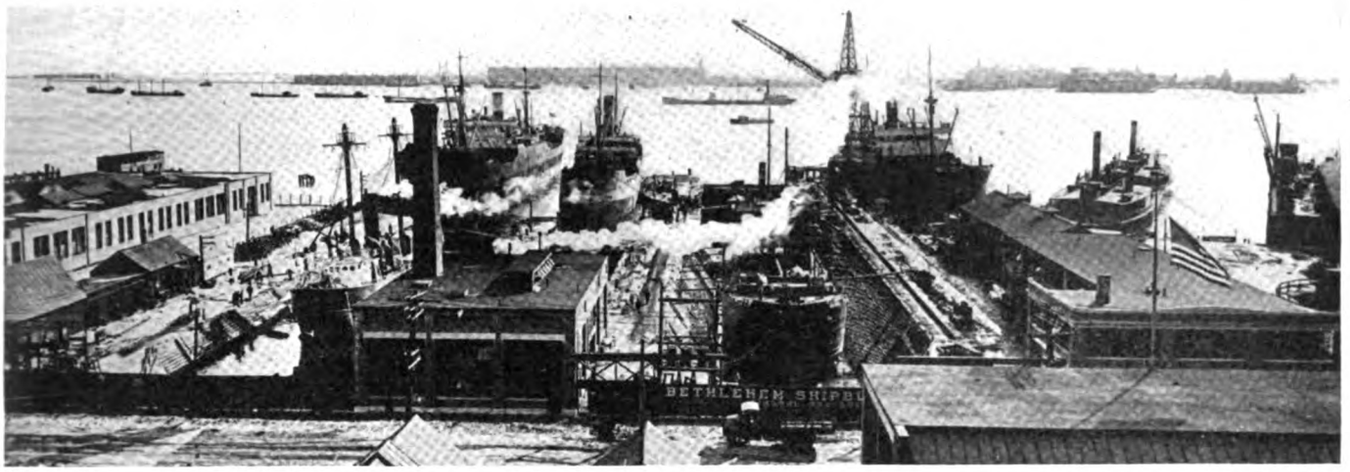
Steam will be supplied by one steel, cylindrical return tube, single ended, Scotch marine type boiler, designed for a working pressure of 210 pounds per square inch. There is to be not less than 1,660 square feet of heating surface, the boiler to be fitted for burning coal. Morrison suspension type corrugated furnaces will be used. It will also be equipped with a superheater of the Superheater Company, or equal, being capable of producing 150 degrees of superheat in the main steam line. The auxiliary boiler will consist of one submerged tube vertical marine boiler constructed for a pressure of 150 pounds per square inch with a heating surface of not less than 270 square feet.

There is to be installed one hoisting and hauling engine, Lidgerwood Manufacturing Company, or equal, having double 12 by 12-inch cylinders and three tandem friction drums, the drums to be 18 inches in diameter by 26 inches long. The engine is to have a capacity of 16,000 pounds on one drum at a time. The swinging engine is to have two cylinders 7 by 10 inches and one drum 20 inches in diameter by 10 inches long, the engine having a capacity of not less than 10,000 pounds on a single line.

OTHER EQUIPMENT

Other equipment for the vessel will include the following: Two wooden masts 30 feet 6 inches long with booms 30 feet long and 10 inches in diameter at center; two double barrel, steam driven, reversing capstans with double 7 by 8-inch cylinders and two steam driven, non-reversing, gypsy capstans, with double 4 by 6-inch cylinders; a steam driven refrigerating machine of the dumb bell type of at least one-half ton capacity similar to that manufactured by the Audifren Refrigerating Machine Company of New York; one 5-kilowatt 110-volt direct current generator set, General Electric Company, or equal, and one 2½-kilowatt 110-volt direct current oil engine generator set, Delco Light Company, or equal.

Generated on 2024-09-12 12:20 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN



General View of Simpson Dry Dock Plant

The Bethlehem Co. Modernizes Simpson Dry Dock Plant

SINCE its acquisition in 1922, the Bethlehem Shipbuilding Corporation has been carrying out a complete program of modernization and improvement at the Simpson Dry Dock plant located in East Boston, Mass. It is intended that this plant shall handle all classes of marine repairs. The greater part of the work has already been completed and the final project, that of building special accommodations to take care of a 10,000-ton floating dry dock, is under way.

Improvements in Plant and Equipment

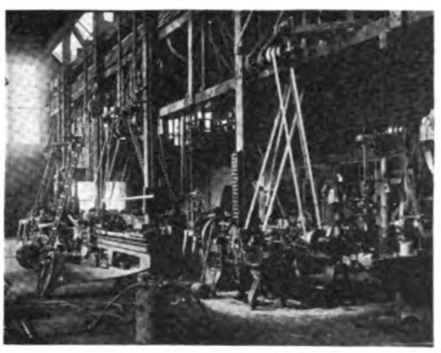
The improvements being made in the plant include the installation of a new traveling crane, new pumping equipment, a new boiler and plate shop, new storage buildings, pipe lines, electrical layout, etc. All wharves have been overhauled and, in some cases, rebuilt. Probably the most important improvement made in connection with the docks is the installation of new pumping equipment at the main pumping station which makes it possible to pump out the docks in one half the time formerly required. All dock gates have been thoroughly overhauled and an electrical pumping system has been installed in the caisson gate.

The plans to bring the 10,000-ton floating dry dock now at the Fore River plant to the Simpson plant will necessitate the construction of special accommodations, including a pier approximately 520 feet long and having a minimum width of 24 feet. It is the intention to moor the floating dry dock on the upstream side of this new pier. At the head of the dock a pile pier with a concrete deck will be built for the runways to the pontoons. At this point too, a control house for the dock master, which will be of brick two stories in height, will be built.

The only additions made to the present machine shop are in the form of light machinery for miscellaneous work. On the ground floor of the new boiler house are located oil-fired boilers and pumping equipment. Two new drainage pumps have been installed and a large steam pump electrified. The entire pumping system throughout the yard has been renovated and new lines for air, water, steam and fire purposes laid in concrete trenches. An electrical repair shop is also located on the ground floor of the boiler house. The second floor is given over to a completely equipped pattern shop.

The old boiler shop has been enlarged and made into a daylight plate, boiler and blacksmith plant.

Boiler, Blacksmith and Pipe Shops and Dock Crane



Machine Shop

Shipyard Expansion

The American Shipbuilding Company announces plans for rebuilding a one story 68 by 100 foot tin shop, a 48 by 83 foot round house, and a 40 by 100 foot goggler shop, at the foot of West 54th street, Cleveland.

Brooklyn School to Give a Course on Diesel Engines

THE Polytechnic Institute of Brooklyn, New York, after considerable preparation is offering a course opening with the fall term in the fundamentals of construction and operation of Diesel and oil engines. This course will be given during the academic year 1924-1925 and will be repeated during 1925-1926. Several varieties of oil engines are available in the laboratory for demonstration and testing.

Special emphasis will be laid on operation and maintenance, but since it is felt that a knowledge of how and why a given type of engine came into being is indispensable for a well-grounded operating knowledge, these matters will be treated in detail. The scientific and mathematical aspects of oil engine construction will be developed with a view to making the operator able to think for himself and will advance far enough to prepare those students who wish it for manufacturing and designing work. In any case, it is planned to cover the subject in far greater detail than is necessary for passing the examinations for certificates to operate motor vessels under the Steamboat Inspection Service.

The course will be in charge of J. Kuttner, a graduate of the Massachusetts Institute of Technology, who has had considerable Diesel engine operating and construction experience. The course will be given in 20 two-hour sessions commencing on Friday evening, October 3 and continuing each Friday evening (except holidays) until completed. A fee of $25 will be charged for the course.

Keels Laid at Newport News for Clyde Liners

The keel for the steamship *Seminole*, hull No. 275, was laid by the Newport News Shipbuilding and Drydock Company on September 9 for the Clyde Line. Hull No. 274, the *Cherokee*, for the same company, was laid last month. The ships are scheduled for delivery next summer. They were designed by Theodore E. Ferris, naval architect of New York, and will cost about $1,800,000 each.

Generated on 2024-09-12 12:02 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Construction of Matson Liner to Be Under Gibbs Bros. Supervision

A CONTRACT for the revision of the plans and specifications for and the supervision of all the work in connection with the construction of the new passenger steamship of the Matson Line, has been awarded to Gibbs Bros., Inc., marine engineers and naval architects of No. 1 Broadway, New York. The ship will be built by the William Cramp & Sons Ship & Engine Building Company, at a cost of approximately $4,792,000 and completion will require about two years' time.

It was stated that considerable alterations have been made to have the proposed ship meet all government requirements as a naval auxiliary in case of emergency and put the steamer in the front rank as a trans-oceanic passenger carrier.

Morse Yard Offers Low Bid for Repairs To Steamship Dayton

THE Morse Drydock & Repair Company with a price of $36,500 and thirty days' time, submitted the lowest bid for the reconditioning of the steamship *Dayton*, at the opening of tenders by Charles E. Ross, of 16 Exchange Place, on Wednesday, September 10. The vessel is at Baltimore and award of contract is pending. The following prices were submitted:

Morse	$36,500	30 days
Maryland Drydock Co.	42,100	30 days
Newport News	42,750	30 days
W. & A. Fletcher	44,800	26 days
Bethlehem	46,857	40 days
Robins	47,690	35 days
Tietjen & Lang	48,825	36 days
Federal	(no bid)	

Bethlehem Awarded Contract for Standard Oil Diesel Tanker

THE Bethlehem Shipbuilding Corporation, Union Plant, has been awarded a contract for the construction of a tanker for the Standard Oil Company of California. The ship will have an overall length of 221 feet; length between perpendiculars 210 feet; beam, molded, 36 feet; depth, molded, 16 feet 6 inches, and an approximate mean draft, loaded, of 13 feet 6 inches.

It is announced that the vessel will be driven by Diesel-electric engines and is for use in the Hawaiian Inter-island service.

Port Developments to Be Made in Cleveland

THE directors of the Cleveland Chamber of Commerce have given their sanction to the city's plan for a land and drydock project on Lake Erie between East 49th and East 53rd streets. The sanction, however, carries one condition—that the proposed breakwater and jetties be of so-called wharf construction, which will enable the land to be utilized for dockage as occasion requires. It will involve an expenditure of not less than $550,000.

Steamship Arabic Repaired at Morse Dry Dock Plant

UPON reaching New York, after her unusual encounter with a West Indian hurricane recently, the White Star liner *Arabic* was put into dry dock at the Morse Dry Dock & Repair Company yard, Brooklyn, for reconditioning. While in dock an examination was made of her hull and all parts that had sustained damage due to the gale. Within thirty hours of the time of

S. S. Arabic in Dry Dock at Morse Plant

docking the ship was returned to her loading pier where repairs were completed by Morse workmen.

On the boat deck considerable damage was done to the bulwarks, port lights, lifeboats, lifeboat davits, ventilators, king posts and other deck fittings. The starboard side of the vessel's hull was somewhat strained on account of the heavy seas which she encountered necessitating repairs to the shell plating in way of the bridge. Practically no engine trouble occurred throughout the heavy weather.

Although the damage was quite extensive, none of it was sufficient to impair the seaworthiness of the vessel which sailed on schedule time. Difficulty was experienced in the case of certain German fittings that could not be obtained in this country. For these, special patterns were made and the parts were cast and machined to correspond with the designs of the builders of the vessel.

Shipyard Destroyed and Vessels Damaged by Fire

J. Coughlan & Sons' shipyard and plant, at Vancouver, B. C., was completely destroyed by fire of unknown origin on the afternoon of August 30, and the Northwest Dredging Company's dredge, "Mud Lark," which was tied up for repair, together with a number of small craft also were destroyed. The loss of the Coughlan plant is estimated at half a million and the dredge at fifty thousand dollars.

This is the second time that the Coughlan plant has been destroyed by fire. The plant together with two large, nearly-completed ships, ready for war service, was burned in 1916.

To Take Estimates For Reconditioning of U.S.S. Hartford

ON September 5, the *U. S. S. Hartford*, receiving ship at the Navy Yard, was moved to drydock to have her hull repaired, and will be in the dock from four to eight weeks. While the repairs are under way an estimate will be made of the cost of restoring the historic craft to her former condition when, during the civil war, she was Rear Admiral David Farragut's flagship.

For years the *Hartford* has been a receiving ship. Some time ago, a movement was started to have the government transfer the vessel to the Washington Navy Yard, there to be preserved as an historical relic, and it is with that object in view that an estimate as to the cost will be made.

Chesapeake & Ohio Awards Contracts for Floating Equipment

CONTRACTS aggregating $176,000 have been awarded by the Chesapeake and Ohio Railway to provide additional equipment to its floating property on Hampton Roads, Va., according to an announcement recently made by President W. J. Harahan.

The principal addition to the Chesapeake and Ohio fleet will be a new steel carfloat, with a capacity of carrying thirty-two cars, which will be built by the New York Shipbuilding Corporation at a cost of $138,500.

The Newport News Shipbuilding and Drydock Company has been awarded a contract to build two freight house barges at a cost of $18,800 each.

Sternwheel Steamer Donora Delivered

THE new river steamer *Donora*, built by the Howard Shipyards, Jeffersonville, Ind., for the American Steel & Wire Company of Pittsburgh, to operate as a pool boat around Pittsburgh, has been delivered to her owners after a successful trial trip.

On the trials the American Steel & Wire Company was represented by Capt. Moron and Mr. Kramer of the technical department. The Power Specialty Company, who have fitted Foster radiant heat type superheaters in this steamer, were represented by their Cincinnati agent, Mr. F. W. Leahy, and J. J. Nelis of New York.

This tow boat was found exceptionally easy to handle and all of the modern equipment installed worked successfully. The superheat was remarkably steady, similar to the results obtained on the nine other western river steamers equipped with Foster superheaters.

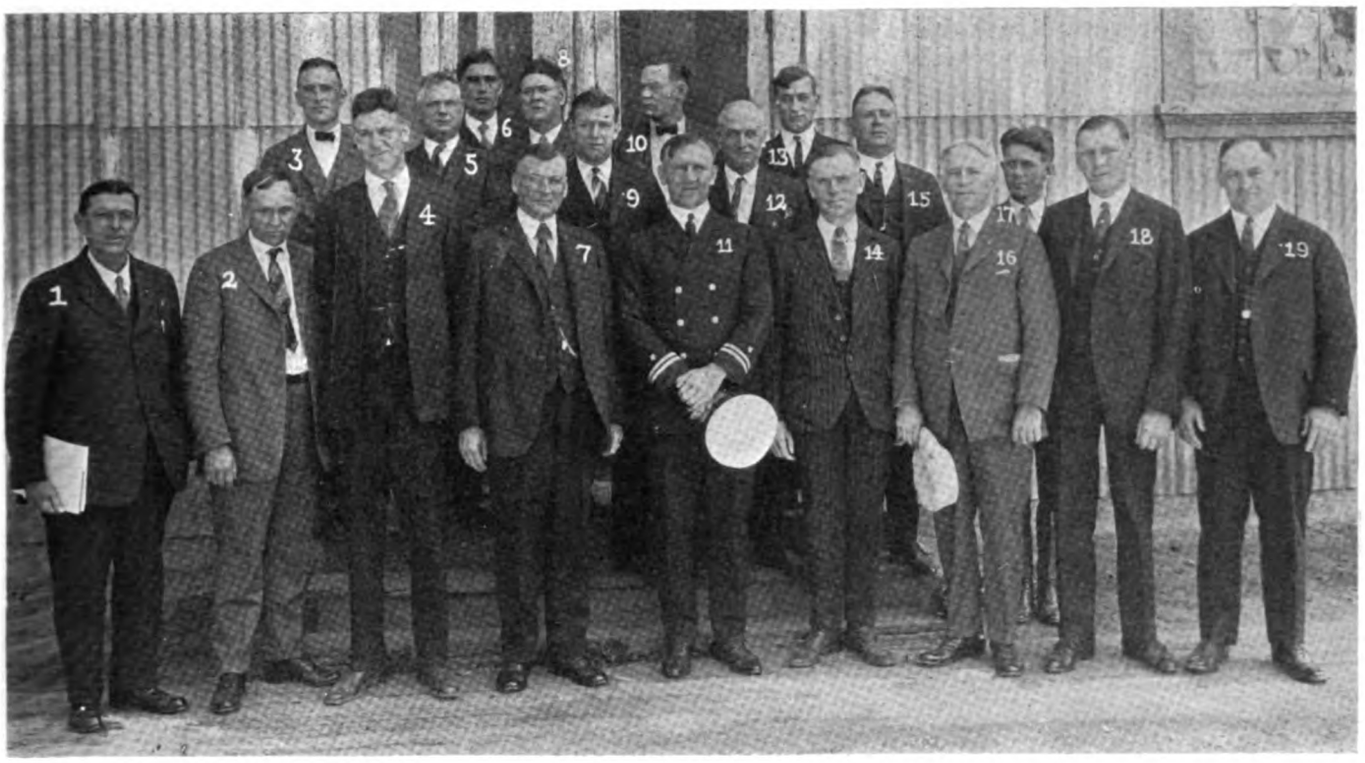
Great Lakes Repair Work

The steamer *Otto M. Reiss* was in collision with the schooner *City of Grand Haven* off St. Helena Island during a heavy fog, September 15. The *Reiss* picked up the schooner and towed her to Mackinaw.

The steamer *Michael Gallagher* is in drydock at Cleveland, undergoing repairs as a result of going aground near the Bar Point lightship.

The steamer *J. M. Schoonmaker*, which was damaged in the outer harbor during a recent lake storm has been drydocked at the River Rouge yards.

Generated on 2024-09-12 12:03 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN



Class No. 6 at Mare Island Fuel Oil School

(1) W. H. Lenz, 1st asst. eng., S. S. West Gambo; (2) G. G. Nelson, chief eng., S. S. West Cadron; (3) Mr. Jack, U. S. Shipping Board; (4) J. W. Groesch, 1st asst. eng., S. S. Cuprenn; (5) G. A. Snyder, chief eng., S. S. City of Spokane; (6) S. Kachalio, Jr. eng., S. S. Pres. Pierce; (7) E. H. Kannady, chief eng., S. S. West Montop; (8) J. D. Goss, 1st asst. eng., S. S. West Cadron; (9) R. M. Dudley, chief eng., S. S. Bearport; (10) B. B. Benny, Jr. eng., S. S. Pres. Pierce; (11) Mr. Rasch, officer in charge; (12) A. E. Biggs, chief eng., S. S. West Cader; (13) A. W. Welch, 1st asst. eng., S. S. Bearport; (14) L. L. Bevens, chief eng., S. S. West Isen; (15) G. W. Elliot, 2nd asst. eng., S. S. Pres. Pierce; (16) E. J. Hodgson, 1st asst. eng., S. S. West Cader; (17) J. H. Frickie, Pacific Mail Co.; (18) J. H. Persson, chief eng., S. S. West Cajoot; (19) H. J. Winship, chief eng., S. S. West Gambo.

Tank Ship Allentown Contract Awarded to Staten Island Yard

THE contract for the installation of Diesel-electric machinery in the tanker *Allentown*, which is to be renamed the *J. W. Van Dyke*, has been awarded by the Atlantic Refining Company to the Staten Island Shipbuilding Company.

The ship was recently purchased from the Shipping Board, is of 7,057 deadweight tons and will have a power plant consisting of three Ingersoll-Rand oil engines of the direct-injection type. Each engine is direct-connected to a Westinghouse generator.

French Shipping and the Eight-Hour Day

IT will be remembered that in view of the non-extension to other maritime countries of the enforcement of the eight-hour working day in the merchant marine, the French Government decided in September, 1922, to abrogate the eight-hour day law with regard to the men of the deck and general services on merchant ships, the said law being still enforced with regard to the men employed in the engine service. As a protest against that measure, the French seamen went on a 54-day strike which was highly prejudicial to the interests of the shipping trade.

The French seamen have now taken advantage of the recent political developments and of the advent of a Radical Cabinet to renew their claim for the complete enforcement of the eight-hour day law.

A joint committee of representatives of shipowners and seamen has been appointed by Mr. Leon Meyer, the new Under Secretary of State for the Mercantile Marine in the Herriot Cabinet, with a view to entering into an agreement on that subject: that attempt proved unsuccessful, and it is now up to the Government to bring about a solution of the question which has become serious owing to the persistent demands of the seamen for the enforcement of the eight-hour day. On the other hand, the steamship companies have set forth that they will not accept the enforcement of that regime which would greatly handicap them with regard to foreign shipowners.

Fleet of Modern, Fast Passenger and Freighters Advocated in Address by Shipping Board Vice Commissioner

THAT the fleet of steamers about to be converted to Diesel ships by the Shipping Board and disposed of to private companies when ocean conditions warrant should be but the advance squadron of a modern fleet of fast freighters and powerful passenger craft fitted to maintain America's proper position on the sea, was the statement of Vice Chairman E. C. Plummer, of the United States Shipping Board, in an address before the Atlantic Deeper Waterways Association at Newark, New Jersey, on September 18. After discussing canal transportation as carried out abroad and stating that both England and Germany are building the most economical type of modern ships to compete for foreign markets, Mr. Plummer spoke in part as follows:

"To enable us to meet this competition for foreign markets on more nearly equal terms than at present prevails, the Shipping Board is preparing to transform a fleet of steamers now on hand into Diesel engine craft, which it will dispose of to private companies whenever ocean conditions shall become such as to make it possible for American capital to venture into them with a prospect of success. They should be but the advance squadron of a modern fleet of fast freighters and powerful passenger craft fitted to maintain our proper position on the sea.

"Of course, there will be objectors to such an American programme, just as there have been for half a century, but the World War was an 'eye opener' in more than one sense and I see signs that our people are 'getting on' to this game." . . .

"It is our duty to do whatever may be necessary to secure and maintain such a fleet under our flag. It is time Europeans learned that this country can have a policy of its own and that the security and prosperity of our own people is again one of the controlling ideas in the minds of our leaders."

Civil Service Examinations

The United States Civil Service Commission announces an open competitive examination for a marine draftsman on October 21, to fill a vacancy in the Lighthouse Service, at an entrance salary of $2,220 a year, advancement in pay to be made without change in assignment up to $2,700 a year, and an examination for a local and assistant inspector of boilers and a local and assistant inspector of hulls on October 22 and 23, at entrance salaries ranging from $2,100 to $2,950 a year.

Generated on 2024-09-12 12:04 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Award of New York Central Ferryboat Job Expected Soon

AWARD of a contract is pending for the construction of a double deck screw propelled steel ferryboat for the New York Central Railroad Company. The bids received September 19 were as follows:

	Fletcher Engine	Alternate	Time
Staten Island..	$448,800	$439,800	10 Months
Federal	459,000	447,000	8 "
Sun	481,984	444,984	9½ "
Newport News	456,000	449,000	8 "
New York Shipbuilding.	473,000	463,000	9 "
Todd	475,000	465,600	9 "
W. & A. Fletcher	477,000	...	9 "
Bethlehem	489,400	481,500	9 "
William Cramp & Sons	506,000	492,000	9 "

Steel Barge Bids Oct. 22

Sealed proposals will be received by the Mississippi River Commission, 1st & 2nd Districts, 1006 McCall Building, Memphis, Tenn., until 11 A. M., October 22, 1924, and then opened, for furnishing 12 steel barges.

TRADE PUBLICATIONS

SULZER DIESEL ENGINES.—Sulzer Bros., Ltd., Winterthur, Switzerland, has recently sent out a list of motorships equipped with Sulzer two-stroke Diesel marine engines. The list includes all ships so equipped over 5,000 tons deadweight.

HOISTS AND WINCHES.—Loose-leaf pages for insertion in Catalogue 21 of the American Engineering Company, Philadelphia, have been prepared describing hoists and winches for ship and dock service. These pages take up general specifications of various types of hoists with illustrations showing the various parts of the mechanisms.

PORTABLE AIR POWER.—Under the title of "One Hundred and One Ways to Save Money with Portable Air Power," the Ingersoll-Rand Company, 11 Broadway, New York, has prepared a most attractive catalogue showing compressed air tool operation as applied to various industries together with details of many of the products of the company.

BETTER FOUNDRY PRACTICE.—The Policy Holders' Service Bureau, Group Insurance Division, Metropolitan Life Insurance Company, New York, has issued Bulletin Number Three on the subject of foundry practice. This bulletin takes up the planning and controlling of production in a foundry with a special explanation of the methods necessary in getting castings out according to schedule.

BUSCH-SULZER DIESEL ENGINES.—The history of Diesel engine construction, covering a period of 26 years, has been prepared by the Busch-Sulzer Bros.-Diesel Engine Company, St. Louis, in catalogue form. The principles of Diesel engine operation are outlined, comparative data between this type of power plant and other types given, with typical cost charts for various forms of power. The catalogue is profusely illustrated with both land and marine installations and layouts.

PROPELLING A CARGO BOAT.—This is a booklet by D. B. Morison, M.I.N.A., managing director of Messrs. Richardsons, Westgarth & Company, Ltd., Hartlepool, England. The article, which originally appeared in the "Story of Shipping" published by *Sports and Sportsmen, Ltd.*, takes up in some detail the propulsion of ships by reciprocating engines, turbines and internal combustion engines. A catalogue section is contained in the book, showing the various type engines, boilers and other products manufactured by this concern.

AUTOMATIC STATION CONTROL EQUIPMENT.—A 27-page bulletin on automatic station control equipment, designated as No. 47,731, which has been prepared by the General Electric Company, Schenectady, N. Y., describes briefly the uses and advantages of this type of equipment and is well illustrated. The greater part of the bulletin is given over to a list of installations that have been made up to January 1, 1924, giving the name of the company, station, type of apparatus, kilowatt capacity and incoming and outgoing voltage.

BUSINESS NOTES

The Emergency Fleet Corporation has opened an office at Santos, Brazil, with John R. Bolin in charge. Mr. Bolin has been the port representative of the corporation at Brazil.

Announcement is made by the Insurance Company of the State of Pennsylvania, of the appointment of Seeley & Company as Pacific Coast ocean marine agents, having offices at Los Angeles, San Francisco, Portland and Seattle.

The Atlantic, Gulf & Far East Steamship Company has changed its name to the Atlantic, Gulf & Oriental Steamship Company. This corporation was organized recently to operate the consolidated services of the Shipping Board to ports of the Far East.

The United Gulf Steamship Company, a merger of S. Sgitcovich & Company of Galveston, and Trosdal, Plant & Lafonta of New Orleans, organized under Louisiana laws with a capitalization of $250,000, has received a permit to do business in Texas, with T. R. Hancock as state agent. Texas headquarters will be in Galveston.

MARINE SOCIETIES

AMERICA

American Society of Naval Engineers
Navy Department, Washington, D. C.
Secretary-Treasurer—Commander Bryson Bruce, U. S. N., Bureau of Engineering, Navy Department, Washington, D. C.

Society of Naval Architects and Marine Engineers
29 West 39th Street, New York
Secretary and Treasurer—Daniel H. Cox.

National Association of Engine and Boat Manufacturers
29 West 39th Street, New York City
Secretary—R. R. A. Hand.

United States Naval Institute
Naval Academy, Annapolis, Md.
Secretary and Treasurer—Commander H. K. Hewitt, U. S. N.

American Marine Association
15 Park Row, New York
President—Frank J. Shipman.

The New York Tow Boat Exchange
11 Moore St., New York.
Secretary—Irving G. Keller.

Port of New York Authority
11 Broadway, New York
Chairman—E. H. Outerbridge.
Secretary—William Leary.

National Association of Masters, Mates and Pilots
National Secretary—M. D. Tenniswood, 308 Vine St., Camden, N. J.

American Society of Marine Designers
Secretary—B. G. Barnes, 202 Kendrick Ave., Quincy, Mass.

National Marine Engineers' Beneficial Association
Headquarters 311-315 Machinists Building. Washington, D. C.
Secretary-Treasurer—George A. Grubb.

Atlantic Coast Shipbuilders' Association
1600 Walnut Street, Philadelphia, Pa.
Secretary—C. S. King.

Council of American Shipbuilders, Inc.
30 Church St., New York
President—Homer L. Ferguson.
Secretary-Treasurer—Henry C. Hunter.

American Steamship Owners' Association
11 Broadway, New York
President—Alfred Gilbert Smith.
Vice-President and General Manager—Winthrop L. Marvin.

United States Ship Operators' Association
149 Broadway, New York
President—C. H. Potter.

National Merchant Marine Association
Munsey Bldg., Washington, D. C.
President—Hon. J. E. Ransdell.

The Maritime Association of the Port of New York
78 Broad St., New York City
President—Charles H. Potter.
Secretary—Walter F. Firth.

Lake Carriers' Association
President—Wm. Livingstone, Dime Bank Building, Detroit, Mich.
Secretary—George A. Marr, Rockefeller Building, Cleveland, O.

Neptune Association
21 Pearl St., New York City
Secretary-Treasurer—Captain John F. Milliken.

Ocean Association of Marine Engineers
15 Whitehall St., New York City
Secretary—Bert L. Todd.

CANADA

Grand Council N. A. of M. E. of Canada
Grand Secretary-Treasurer—Neil J. Morrison, Box 886, St. John, N. B.

GREAT BRITAIN

Institution of Naval Architects
Adelphi Terrace, London, W. C.

Institution of Engineers and Shipbuilders in Scotland
39 Elmbank Crescent, Glasgow.

Northeast Coast Institution of Engineers and Shipbuilders
Bolbec Hall, Westgate Road, Newcastle-on-Tyne

Institute of Marine Engineers, Incorporated
85/88 The Minories, London, E.1.

ITALY

Collegio Degli Ingegneri Navali e Meccanici in Italia

Generated on 2024-09-12 12:21 GMT / https://hdl.handle.net/2027/mdp.39015080127551
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN